ATTACHMENT F

WARE MALCOMB

ARCHITECTURE
PLANNING
INTERIORS

CIVIL ENGINEERING
BRANDING
BUILDING MEASUREMENT

December 9, 2022

Town of Castle Rock
100 N. Wilcox Street
Castle Rock, CO 80104
Attn: Kevin Buffington

Re: Drainage Conformance Letter
Meadows Filing No. 19, Lot 2 North Parcel D2A, Senior Housing – SDP22-0032

Dear Mr. Buffington:

This letter has been prepared in lieu of a formal drainage report as the Meadows Filing No. 19, Lot 2 North Parcel D2A, Senior Housing (site) is part of the Master Drainage study Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North (CD21-0042), prepared by Terracina Design, LLC, dated February 2022. The site project is located north of Timber Mill Pkwy and south of East Plum Creek. The site is in a portion of Section 28, Township 7 South, Range 67 West of the 6th Principal Meridian, Castle Rock, Colorado. The object of this letter is to demonstrate that the proposed development within Lot 2 North parcel D2A complies with Master Drainage study CD21-0042. We acknowledge that the Town of Castle Rock's review of this letter is only for general conformance with submittal requirements, current design criteria, and standard engineering principles and practices.

Description of Property

The proposed development includes construction of a new 200-unit affordable senior housing multifamily with associated parking lots and landscaping on an undeveloped 5.5 +/- acre site. The proposed site plan will result in a weighted imperviousness of 68%.

The site has been classified by the Natural Resources Conservation Service (NRCS) as 37.6% Bresser sandy loam (hydrologic group B), 29.2% Newlin gravelly sandy loam (hydrologic group B), 7.6% Sampson loam (hydrologic group B), and 25.6% Sandy wet alluvial land (hydrologic group D). Vegetation is light, with most of the site consisting of sparse grass cover. The NRCS web soil survey has been included in the appendix of this letter.

According to the Flood Insurance Rate Map Number 08035C0167G, dated March 16, 2016, the project site is located within zone X which is of minimal flood hazard. The FIRM Map has been included in the appendix of this letter for reference.

Master Study

According to the Master Drainage study CD21-0042, Pond A was designed for 33.4 acres which includes the 5.467 acres of the site. Pond A was designed as a Full-spectrum detention facility that includes an additional 0.5 times the 100-year detention volume as water quality capture volume. As Pond A will provide water quality and detention to the site, no on-site water quality/detention facility is required. The improvements are anticipating having no impacts on downstream conditions. The site is part of CD21-0042 Basins A6 and A7. These basins were analyzed for the design of Pond A to be 90% imperviousness and with a total runoff of 51.23 cfs and 45.76 cfs respectively.

Stormwater Quality Design Process

The four steps process of section 14.1.1 of the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (SDDTC), was considered for the design of the site.

Roof drains are disconnected and daylighting into the area around the building that includes different types of surfaces to allow infiltration before the runoff reaches the proposed storm network. In addition, as mentioned above, water capture volume and detention are being provided for the site within Pond A designed by Terracina Design, Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North (CD21-0042), dated February 2022. Also, during construction, various best management practices will be put in place to prevent sedimentation and any potential contamination within adjacent roadways, properties, and existing storm systems and natural channels.

Maintenance

The owner, successors, and heirs are responsible for all on-site private drainage facilities. Inlets should be checked routinely and cleared of debris, as necessary.

Hydrologic Criteria

In accordance with the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (SDDTC), the minor storm for the proposed development type is evaluated as the 5-year storm, and the major storm is evaluated as the 100-year storm. For this letter, the site was divided in several sub-basins which encompasses the site plus part of the proposed joint access on the east site of the site for a total of approximately 5.61 (+/-) acres with a proposed weighted imperviousness of 70%.

The design storms were found using the SDDTC Table 6-1 and have been evaluated with 1-hour point rainfall depths of 1.43 inches for the 5-year storm and 2.60 inches for the 100-year storm. These 1-hour point rainfall depths were used to determine rainfall intensity for hydrologic calculations.

The peak discharge for the storm sewer analysis was calculated using the following Rational Method formula:

$Q = C\ i\ A$

Where:

Q = peak discharge (cfs)
C = runoff coefficient from UDFCD manual
i = rainfall intensity (inches/hour)
A = drainage area (acres)

Runoff coefficients, or “C” values, have been calculated for the site in accordance with Mile Hight Flood District, UDFCD manual. Refer to Appendix A for the weighted “C” values used in the calculations. Using the Rational Method, the total peak rate of runoff was found to be 30.3 cfs for the major storm. As mentioned above, the master drainage study accounted for basin A6 and A7 to create 51.23 cfs and 45.76 cfs runoff, respectively. The master study also designed the storm sewer to be able to carry these mentioned flows. The proposed site is creating 30.3 cfs which is considerably less than what the master study anticipated. Therefore, the site is complying with the master drainage study, and the existing storm sewer can receive the runoff from the site to safely be conveyed to Pond A.

Summary

The calculations included in this letter and the following appendices analyze the storm runoff from the proposed improvements in Meadows Filing No. 19, Lot 2 North Parcel D2A, Senior Housing to demonstrate that the imperviousness and runoff for the developed parcel complies with the Master Drainage study CD21-0042.

Basin ID	**Area (acres)**	**Imperviousness (%)**	**Q_5 (cfs)**	**Q_{100} (cfs)**
A06	9.73	90	25.54	51.23
A07	7.59	90	22.81	45.76
Site	5.61	70	12.9	30.3

Should you have any questions or comments, please feel free to contact me at (303) 561-3333.

Sincerely,

Ware Malcomb,

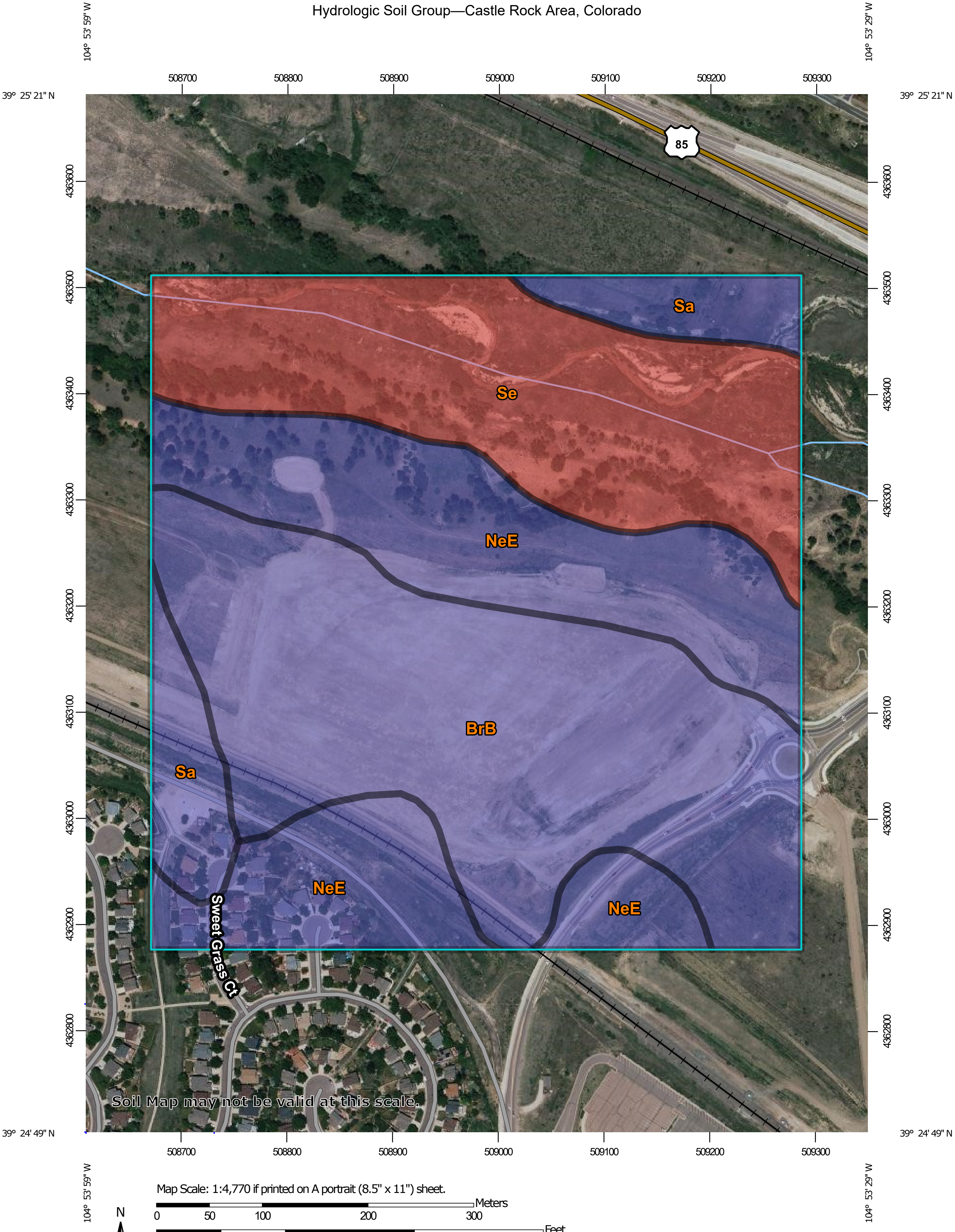
Ted Swan, PE
Director of Civil Engineering

CC: Ileana Contreras icontreras@waremalcomb.com 303.689.1518

APPENDIX A:

SOIL CLASSIFICATION
FEMA MAP

Hydrologic Soil Group—Castle Rock Area, Colorado



Map Scale: 1:4,770 if printed on A portrait (8.5" x 11") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

▭ Area of Interest (AOI)

Soils

Soil Rating Polygons

🟪 A
🟩 A/D
🟦 B
🟫 B/D
🟦 C
🟨 C/D
🟥 D
⬜ Not rated or not available

Soil Rating Lines

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

Soil Rating Points

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

Water Features

〰 Streams and Canals

Transportation

┼┼┼ Rails
〰 Interstate Highways
〰 US Routes
〰 Major Roads
〰 Local Roads

Background

▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Castle Rock Area, Colorado
Survey Area Data: Version 14, Aug 31, 2021

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	B	36.4	37.6%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	B	28.3	29.2%
Sa	Sampson loam	B	7.4	7.6%
Se	Sandy wet alluvial land	D	24.8	25.6%
Totals for Area of Interest			**96.9**	**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.

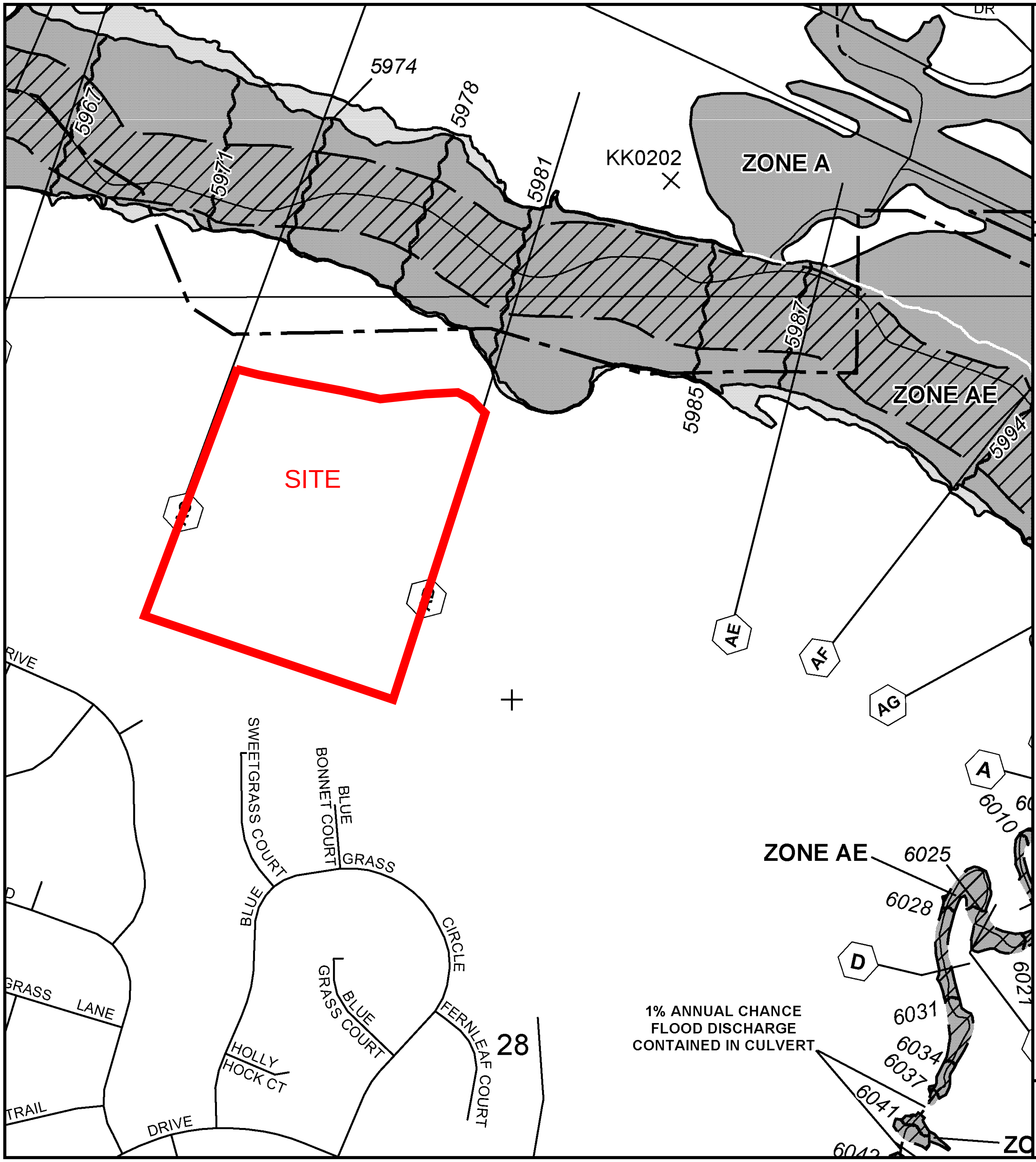
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

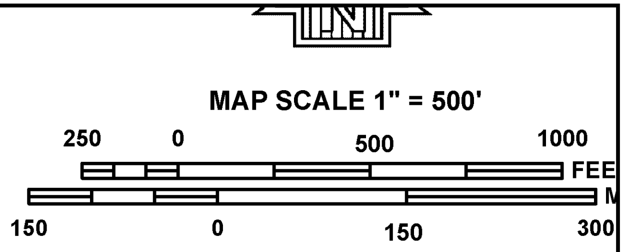
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher





NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0167G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 167 OF 495

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CASTLE ROCK, TOWN OF	080050	0167	G
DOUGLAS COUNTY	080049	0167	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08035C0167G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

APPENDIX B:

HYDROLOGY CALCULATIONS
HYDRAULIC CALCULATIONS

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🟩 = FORMULA CELLS
🟦 = USER INPUT CELLS

PROJECT: The Meadows Lot 2N D2A
JOB NO.: DCS22-4026
CALC. BY: ICA
DATE: 8/30/2022

Project Location
User Input ▾

IDF Rainfall Data

	P_1: 1-hour Rainfall Depths (inches)	
	Minor Storm	**Major Storm**
T_d	5-Year ▾	100-Year ▾
Minutes	**1.43**	**2.60**
5	4.85	8.82
10	3.87	7.03
20	2.81	5.11
30	2.24	4.08
40	1.88	3.42
50	1.63	2.97
60	1.45	2.63
120	0.89	1.62

Equation 5-1 $I=(28.5*P_1)/(10+T_d)^{\wedge 0.786}$

I = rainfall intensity (inches per hour)

P_1 = 1-hour point rainfall depth (inches)

T_d = storm duration (minutes)

Reference:

1) Urban Drainage and Flood Control District - Urban Storm Drainage Criteria Manual Volume 1, 2017
2) NOAA Atlas 14, Volume 8, Version 2
   http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=co

PROJECT:	The Meadows Lot 2N D2A
JOB NO.:	DCS22-4026
CALC. BY:	ICA
DATE:	10/13/2022

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Impervious Percentages - from Urban Drainage Table 6-3

Roof	90%	Land Use 5	0%
Paved	100%	Land Use 6	0%
Drive and Walks	90%	Land Use 7	0%
Lawns	2%	Land Use 8	0%

SOIL TYPE: B (use equation from Table 6-4)

🟩 = FORMULA CELLS
🟦 = USER INPUT CELLS

PROPOSED COMPOSITE IMPERVIOUSNESS

		Weighted Impervious and C Values					Areas (ac)							
Basin	**Area (ac)**	**Imp.**	C_2	C_5	C_{10}	C_{100}	**Roof**	**Paved**	**Drive and Walks**	**Lawns**	**Land Use 5**	**Land Use 6**	**Land Use 7**	**Land Use 8**
A0	0.841	60%	0.46	0.49	0.54	0.71	0.05	0.41	0.04	0.33				
A1	0.317	78%	0.62	0.65	0.68	0.79	0.08	0.15	0.02	0.06				
A2	0.282	83%	0.68	0.71	0.73	0.82	0.13	0.12	0.002	0.03				
A3	0.841	86%	0.71	0.73	0.76	0.83	0.18	0.53	0.04	0.09				
OS1	0.136	100%	0.84	0.86	0.87	0.90	0.00	0.14	0.00	0.00				
B1	0.106	47%	0.35	0.38	0.44	0.65	0.05	0.00	0.00	0.05				
B2	0.442	53%	0.40	0.43	0.48	0.67	0.20	0.00	0.05	0.19				
B3	0.086	46%	0.33	0.37	0.43	0.64	0.04	0.00	0.00	0.04				
B4	0.830	89%	0.73	0.76	0.78	0.84	0.18	0.53	0.05	0.07				
B5	0.460	42%	0.31	0.34	0.40	0.62	0.19	0.00	0.02	0.25				
B6	1.270	66%	0.52	0.55	0.59	0.74	0.18	0.60	0.08	0.41				
Total	5.611	70%	0.56	0.59	0.63	0.76	1.28	2.48	0.31	1.54				

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STANDARD FORM SF-2

TIME OF CONCENTRATION SUMMARY

Calculated By: ICA
Date: 10/13/2022

Project: The Meadows Lot 2N D2A
Job No.: DCS22-4026
Checked By: DFA

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)					t_c CHECK (URBANIZED BASINS)				FINAL t_c	REMARKS
Basin (1)	i (2)	C_5 (3)	AREA Ac (4)	LENGTH Ft (5)	SLOPE % (6)	t_i Min (7)	LENGTH Ft (8)	Cv	SLOPE % (9)	VEL. FPS (10)	t_t Min (11)	COMP. t_c (12)	L_t Ft (13)	S_t % (14)	tc (Equation 6-5) Min (15)	Min (16)	
A0	0.60	0.49	0.84	91	3.8	6.73	174	20	1.1	2.09	1.38	8.1	174	1.09	17.4	8.12	
A1	0.78	0.65	0.32	103	6.8	4.35	72	20	2.5	3.18	0.38	4.7	72	2.52	13.2	5.00	
A2	0.83	0.71	0.28	94	2.0	5.47	86	20	1.1	2.1	0.7	6.2	86	1.12	12.5	6.15	
A3	0.86	0.73	0.84	73	5.4	3.23	542	20	2.1	2.9	3.2	6.4	542	2.05	14.3	6.39	
OS1	1.00	0.86	0.14	43	5.9	1.58	304	20	3.8	3.9	1.3	2.9	304	3.75	10.1	5.00	
B1	0.47	0.38	0.11	56	2.0	7.70	68	15	2.0	2.1	0.5	8.2	68	2.01	18.5	8.24	
B2	0.53	0.43	0.44	95	2.0	9.39	41	15	2.9	2.6	0.3	9.7	41	2.93	17.3	9.65	
B3	0.46	0.37	0.09	40	2.0	6.69	14	15	3.1	2.6	0.1	6.8	14	3.06	18.4	6.78	
B4	0.89	0.76	0.83	72	3.2	3.57	375	20	2.0	2.8	2.2	5.8	375	2.03	12.9	5.76	
B5	0.42	0.34	0.46	32	2.0	6.22	33	15	2.0	2.1	0.3	6.5	33	2.00	19.1	6.48	
B6	0.66	0.55	1.27	160	3.3	8.51	90	20	1.4	2.4	0.6	9.1	90	1.40	15.5	9.15	

Equation 6-3 $t_i=((0.395(1.1-C_5)SQRT(L))/(S_o\text{^}0.33))$
Equation 6-5 $t_c=(26-17i)+(L_t/(60(14i+9)SQRT(S_o)))$

🟩 = FORMULA CELLS
🟦 = USER INPUT CELLS

NRCS Conveyance Factor K Table - Cv Value	
Heavy Meadow	2.5
Tillage/Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

Calculated By: ICA
Date: 10/13/2022
Checked By: DFA
5-Year 1-hour rainfall= 1.43

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project: The Meadows Lot 2N D2A
Job No.: DCS22-4026
Design Storm: 5-Year

🟩 = FORMULA CELLS
🟦 = USER INPUT CELLS

BASIN	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	REMARKS
	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)				
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A0	0		0.84	0.49	8.1	0.42	4.18	**1.7**													
A1	1		0.32	0.65	5.0	0.21	4.85	**1.0**													
	2								8.1	0.6	4.18	**2.6**									
A2	3		0.28	0.71	6.2	0.20	4.58	**0.9**													
	4								8.1	0.8	4.18	**3.4**									
OS1	5		0.14	0.86	5.0	0.12	4.85	**0.6**													
A3	6		0.84	0.73	6.4	0.62	4.53	**2.8**	6.4	0.7	4.53	**3.3**									
	7								8.1	1.6	4.18	**6.5**									
	8								8.1	1.6	4.18	**6.5**									
B1	9		0.11	0.38	8.2	0.04	4.16	**0.2**													
B2	10		0.44	0.43	9.7	0.19	3.92	**0.7**													
B3	11		0.09	0.37	6.8	0.03	4.44	**0.1**	9.7	0.2	3.92	**0.9**									
	12								9.7	0.3	3.92	**1.0**									
B4	13		0.83	0.76	5.8	0.63	4.66	**2.9**													
	14								9.7	0.9	3.92	**3.5**									
B5	15		0.46	0.34	6.5	0.16	4.50	**0.7**													
	16								9.7	1.0	3.92	**4.1**									
B6	17		1.27	0.55	9.1	0.69	4.00	**2.8**	9.7	1.7	3.92	**6.8**									
	18								9.7	3.3	3.92	**12.9**									

Calculated By: ICA
Date: 10/13/2022
Checked By: DFA
100-Year 1-hour rainfall= 2.60

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project: The Meadows Lot 2N D2A
Job No.: DCS22-4026
Design Storm: 100-Year

🟩 = FORMULA CELLS
🟦 = USER INPUT CELLS

	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE						
BASIN	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I (IN/HR)	Q (CFS)	t_c (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	REMARKS
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A0	0		0.84	0.71	8.1	0.60	7.60	**4.5**													
A1	1		0.32	0.79	5.0	0.25	8.82	**2.2**													
	2								8.1	0.8	7.60	**6.4**									
A2	3		0.28	0.82	6.2	0.23	8.32	**1.9**													
	4								8.1	1.1	7.60	**8.2**									
OS1	5		0.14	0.90	5.0	0.12	8.82	**1.1**													
A3	6		0.84	0.83	6.4	0.70	8.23	**5.8**	6.4	0.8	8.23	**6.8**									
	7								8.1	1.9	7.60	**14.4**									
	8								8.1	1.9	7.60	**14.4**									
B1	9		0.11	0.65	8.2	0.07	7.56	**0.5**													
B2	10		0.44	0.67	9.7	0.30	7.13	**2.1**													
B3	11		0.09	0.64	6.8	0.06	8.07	**0.4**	9.7	0.4	7.13	**2.5**									
	12								9.7	0.4	7.13	**3.0**									
B4	13		0.83	0.84	5.8	0.70	8.48	**5.9**													
	14								9.7	1.1	7.13	**8.0**									
B5	15		0.46	0.62	6.5	0.29	8.19	**2.4**													
	16								9.7	1.4	7.13	**10.1**									
B6	17		1.27	0.74	9.1	0.93	7.28	**6.8**	9.7	2.3	7.13	**16.7**									
	18								9.7	4.2	7.13	**30.3**									

PROJECT: The Meadows Lot 2N D2A
JOB NO.: DCS22-4026
CALC. BY: ICA
DATE: 10/13/2022

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RUNOFF SUMMARY

BASIN LABEL	DESIGN POINT	AREA	LOCAL (CFS)		ACCUMULATIVE (CFS)	
			Q5	Q100	Q5	Q100
A0	0	0.84	1.74	4.53		
A1	1	0.32	1.00	2.21		
	2				2.6	6.4
A2	3	0.28	0.91	1.92		
	4				3.4	8.2
OS1	5	0.14	0.57	1.07		
A3	6	0.84	2.79	5.76	3.3	6.8
	7				6.5	14.4
	8				6.5	14.4
B1	9	0.11	0.17	0.52		
B2	10	0.44	0.74	2.13		
B3	11	0.09	0.14	0.44	0.9	2.5
	12				1.0	3.0
B4	13	0.83	2.93	5.94		
	14				3.5	8.0
B5	15	0.46	0.70	2.35		
	16				4.1	10.1
B6	17	1.27	2.78	6.81	6.8	16.7
	18				12.9	30.3

🟩 = FORMULA CELLS
🟦 = USER INPUT CELLS

MHFD-Inlet, Version 5.01 (April 2021)

INLET MANAGEMENT

Worksheet Protected

INLET NAME	SD-INLET-A6.1 - DP1	SD-INLET-A5.1 - DP3	SD-INLET-A3.1 - DP6
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	1.0	0.9	3.3
Major Q_{Known} (cfs)	2.2	1.9	6.8

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**1.0**	**0.9**	**3.3**
Major Total Design Peak Flow, Q (cfs)	**2.2**	**1.9**	**6.8**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

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INLET MANAGEMENT

Worksheet Protected

INLET NAME	SD-INLET-B5.1 - DP13	SD-INLET-B2.1 - DP17	SD-INLET-A8 - DP0
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	2.9	2.8	1.7
Major Q_{Known} (cfs)	5.9	6.8	4.5

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

Watershed Profile

Overland Slope (ft/ft)			
Overland Length (ft)			
Channel Slope (ft/ft)			
Channel Length (ft)			

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)			
One-Hour Precipitation, P_1 (inches)			

CALCULATED OUTPUT

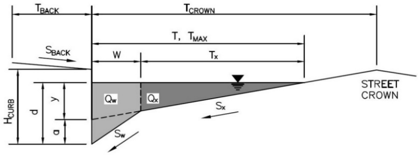
Minor Total Design Peak Flow, Q (cfs)	**2.9**	**2.8**	**1.7**
Major Total Design Peak Flow, Q (cfs)	**5.9**	**6.8**	**4.5**
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A	N/A

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

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

Project: **Castle View Apartments**

Inlet ID: **SD-INLET-A8 - DP0**



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	62.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.043	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	62.0	62.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

		Minor Storm	Major Storm	
	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

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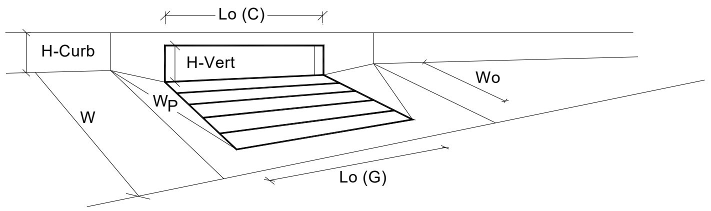
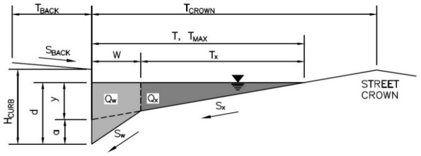


Design Information (Input) Denver No. 16 Combination		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.50	0.50	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.0	17.6	cfs
Interception with Clogging	Q_{wa} =	3.0	8.8	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.6	7.8	cfs
Interception with Clogging	Q_{oa} =	2.8	3.9	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	5.2	10.6	cfs
Interception with Clogging	Q_{ma} =	2.6	5.3	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**2.6**	**3.9**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.17	0.17	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.0	8.5	cfs
Interception with Clogging	Q_{wa} =	1.7	7.0	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.7	7.5	cfs
Interception with Clogging	Q_{oa} =	4.7	6.3	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	2.9	6.9	cfs
Interception with Clogging	Q_{ma} =	2.4	5.7	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**1.7**	**5.7**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	3.00	3.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	9.8	21.4	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	1.023	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.7	4.5	cfs

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

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

Project: **Castle View Apartments**
Inlet ID: **SD-INLET-A6.1 - DP1**



<u>Gutter Geometry:</u>

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	15.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	62.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.043	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	62.0	62.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

		Minor Storm	Major Storm	
	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

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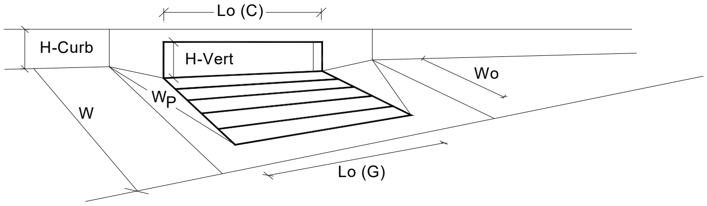
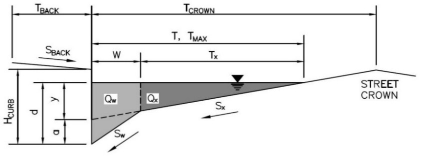


Design Information (Input) Denver No. 16 Combination ▼		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.50	0.50	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.0	17.6	cfs
Interception with Clogging	Q_{wa} =	3.0	8.8	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.6	7.8	cfs
Interception with Clogging	Q_{oa} =	2.8	3.9	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	5.2	10.6	cfs
Interception with Clogging	Q_{ma} =	2.6	5.3	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**2.6**	**3.9**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.17	0.17	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.0	8.5	cfs
Interception with Clogging	Q_{wa} =	1.7	7.0	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.7	7.5	cfs
Interception with Clogging	Q_{oa} =	4.7	6.3	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	2.9	6.9	cfs
Interception with Clogging	Q_{ma} =	2.4	5.7	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**1.7**	**5.7**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	3.00	3.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	9.8	21.4	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	1.023	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	2.2	cfs

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

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

Project: Castle View Apartments
Inlet ID: SD-INLET-A5.1 - DP3



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.140	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	44.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	44.0	44.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

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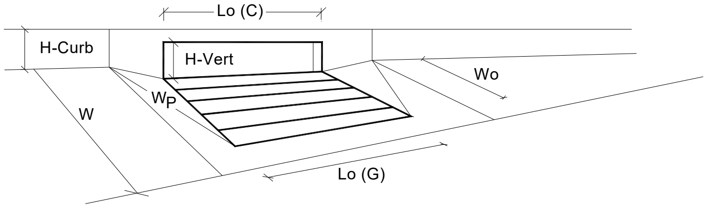


Design Information (Input) Denver No. 16 Combination		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.50	0.50	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.0	17.6	cfs
Interception with Clogging	Q_{wa} =	3.0	8.8	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.6	7.8	cfs
Interception with Clogging	Q_{oa} =	2.8	3.9	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	5.2	10.6	cfs
Interception with Clogging	Q_{ma} =	2.6	5.3	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**2.6**	**3.9**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.17	0.17	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.0	8.5	cfs
Interception with Clogging	Q_{wa} =	1.7	7.0	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.7	7.5	cfs
Interception with Clogging	Q_{oa} =	4.7	6.3	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	2.9	6.9	cfs
Interception with Clogging	Q_{ma} =	2.4	5.7	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**1.7**	**5.7**	**cfs**

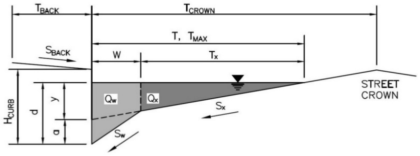
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	3.00	3.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	18.7	43.7	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	1.023	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	0.9	1.9	cfs

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

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

Project: Castle View Apartments

Inlet ID: SD-INLET-A3.1 - DP6



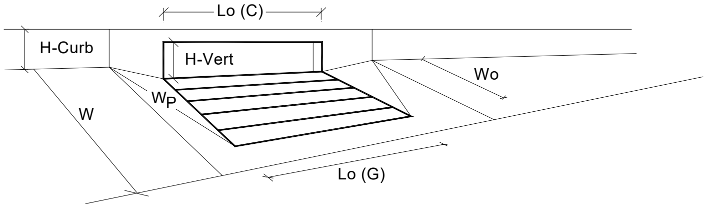
Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	42.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.020		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	42.0	42.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)

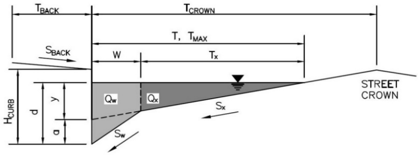


Design Information (Input) Denver No. 16 Combination		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	11.6	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.50	0.50	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.0	16.7	cfs
Interception with Clogging	Q_{wa} =	3.0	8.3	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.6	7.7	cfs
Interception with Clogging	Q_{oa} =	2.8	3.9	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	5.2	10.2	cfs
Interception with Clogging	Q_{ma} =	2.6	5.1	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**2.6**	**3.9**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.17	0.17	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.0	7.9	cfs
Interception with Clogging	Q_{wa} =	1.7	6.6	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.7	7.4	cfs
Interception with Clogging	Q_{oa} =	4.7	6.2	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	2.9	6.6	cfs
Interception with Clogging	Q_{ma} =	2.4	5.5	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**1.7**	**5.5**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	3.00	3.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	18.7	42.0	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	0.989	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.80	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**8.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.3	6.8	cfs

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

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

Project: Castle View Apartments
Inlet ID: SD-INLET-B5.1 - DP13



Gutter Geometry:

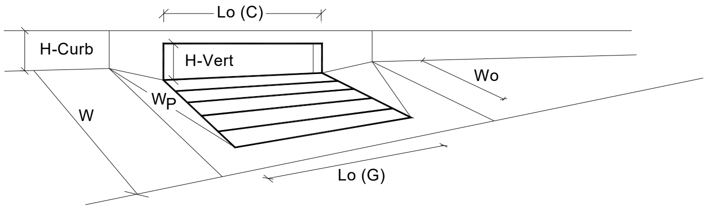
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	62.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.030	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	62.0	62.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



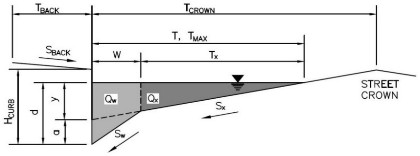
Design Information (Input) Denver No. 16 Combination ▼		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.50	0.50	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.0	17.6	cfs
Interception with Clogging	Q_{wa} =	3.0	8.8	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.6	7.8	cfs
Interception with Clogging	Q_{oa} =	2.8	3.9	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	5.2	10.6	cfs
Interception with Clogging	Q_{ma} =	2.6	5.3	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**2.6**	**3.9**	**cfs**
Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.17	0.17	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	2.0	8.5	cfs
Interception with Clogging	Q_{wa} =	1.7	7.0	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	5.7	7.5	cfs
Interception with Clogging	Q_{oa} =	4.7	6.3	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	2.9	6.9	cfs
Interception with Clogging	Q_{ma} =	2.4	5.7	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**1.7**	**5.7**	**cfs**
Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	3.00	3.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	13.1	29.8	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	1.023	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**3.9**	**8.7**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.9	5.9	cfs

MHFD-Inlet, Version 5.01 (April 2021)

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

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

Project: Castle View Apartments
Inlet ID: SD-INLET-B2.1 - DP17



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.250	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	62.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.050	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.013	

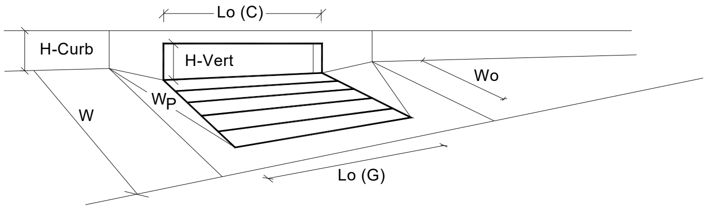
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	62.0	62.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

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

		Minor Storm	Major Storm	
	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



Design Information (Input) Denver No. 16 Combination ▼		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 16 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	inches
Grate Information		MINOR	MAJOR	☐ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Grate Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.50	1.50	
Clogging Factor for Multiple Units	Clog =	0.38	0.38	
Grate Capacity as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	6.6	25.7	cfs
Interception with Clogging	Q_{wa} =	4.1	16.1	cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	11.2	15.7	cfs
Interception with Clogging	Q_{oa} =	7.0	9.8	cfs
Grate Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	7.8	18.1	cfs
Interception with Clogging	Q_{ma} =	4.8	11.3	cfs
Resulting Grate Capacity (assumes clogged condition)	**Q_{Grate} =**	**4.1**	**9.8**	**cfs**

Curb Opening Flow Analysis (Calculated)		MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00	
Clogging Factor for Multiple Units	Clog =	0.08	0.08	
Curb Opening as a Weir (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{wi} =	3.0	16.9	cfs
Interception with Clogging	Q_{wa} =	2.8	15.5	cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)		MINOR	MAJOR	
Interception without Clogging	Q_{oi} =	11.4	15.0	cfs
Interception with Clogging	Q_{oa} =	10.4	13.8	cfs
Curb Opening Capacity as Mixed Flow		MINOR	MAJOR	
Interception without Clogging	Q_{mi} =	5.0	13.7	cfs
Interception with Clogging	Q_{ma} =	4.6	12.6	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	**Q_{Curb} =**	**2.8**	**12.6**	**cfs**

Resultant Street Conditions		MINOR	MAJOR	
Total Inlet Length	L =	6.00	6.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T =	8.7	18.7	ft
Resultant Flow Depth at Street Crown	d_{CROWN} =	0.0	0.0	inches
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.523	1.023	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.71	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.71	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**6.2**	**20.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.8	6.8	cfs

APPENDIX C:

MS4 COMPLIANCE SUMMARY

Summary of Water Quality Conformance to MS4 Permit

The purpose of this worksheet is to document conformance with the Town of Castle Rock's MS4 permit with regard to permanent water quality on land disturbance projects.

Project Name Castle View Apartments, Lot 2 North, The Meadows PD Filing No. 19

Project Owner Castle View Owner LLC

Project Location Town of Castle Rock

ToCR Project Number SDP22-0032

Total Site Area 5.467 **acres**

Total Size of Common Plan of Development ____________________ **acres**

Check all that apply:

☑ **Project within Plum Creek Basin**

☐ **Project within Cherry Creek Basin**

Estimated construction completion date Spring 2024

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1. The water quality control measure(s) for applicable development sites shall meet one of the following base design standards as per the SDDTCM Section 14.4. Please select all design standards that were applied to meet conformance with the MS4 on this site.

- ☐ WQCV standard
- ☐ Pollutant removal standard
- ☐ Runoff reduction standard
- ☑ Applicable site draining to regional WQVC control measure (accepts drainage prior to discharging to WOTS)
- ☐ Applicable site draining to regional WQVC control facility (with receiving pervious area control measure upstream of WOTS)
- ☐ Constrained redevelopment sites standard
  - Imperviousness of existing site ________/________(Imp. Ac/Site Ac) =____%
  - Variance required TCV No. ______________
- ☐ Existing control measure with WQCV per previous criteria standards
  - Reference Construction Permit No. _________________
- ☐ Cherry Creek Basin only, choose one: ☐ Tier 1 ☐ Tier 2 ☐ Tier 3
- ☐ No control measures provided (See Permanent WQ Worksheet for applicability)

Summary of Water Quality Conformance to MS4 Permit

2. Was an exclusion to water quality applied as per SDDTCM Section 13.1.5? ☐ Yes ☐ No
    i. If yes, please select all that apply, provide total excluded impervious area(s) and submit variance, as applicable: TCV No. __________________
        - ☐ Pavement management site

          Excluded impervious area: _______________ acres
        - ☐ Excluded roadway redevelopment

          Excluded impervious area: _______________ acres
        - ☐ Excluded existing roadway areas

          Excluded impervious area: _______________ acres
        - ☐ Above ground and below ground utilities
        - ☐ Large lot single family home
        - ☐ Non-residential and non-commercial infiltration

          Excluded impervious area: _______________ acres
        - ☐ Land disturbance for land to remain undeveloped

          Excluded impervious area: _______________ acres
        - ☐ Stream Stabilization Sites

          Excluded impervious area: _______________ acres
        - ☐ Trails

          Excluded impervious area: _______________ acres
        - ☐ Oil and Gas Exploration

3. For Development and Redevelopment sites, following any exclusions claimed above, was any portion of the site excluded up to 20% of the site and not to exceed one acre? ☐ Yes ☐ No

   If yes, complete the following:

   Excluded area: _______________ acres

   Total Site area: _______________ acres, _______ % site excluded

4. For Constrained sites, was any portion of the site excluded up to 50% of the site and not to exceed 50% of the impervious area? ☐ Yes ☐ No

   If yes, complete the following:

   Excluded area: _______________ acres

   Excluded impervious area: _______________ acres

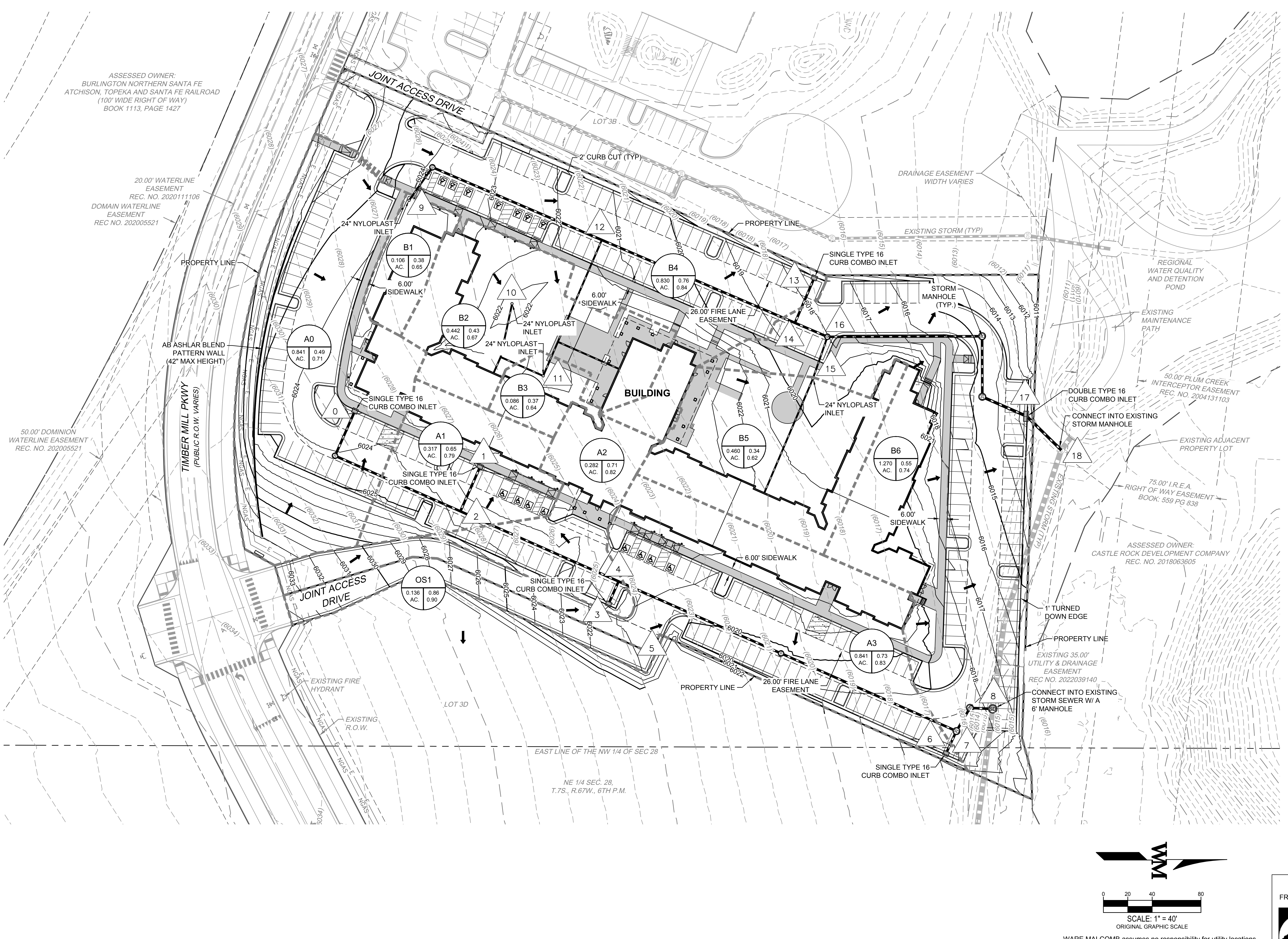
   Total Site area: _______________ acres, _______ % site excluded

   Total Impervious area: ______________ acres, ______ % impervious excluded

APPENDIX D:

DRAINAGE MAP

CAUTION: IF THIS SHEET IS NOT 24"x36" IT IS A REDUCED PRINT



SCALE: 1" = 40'
ORIGINAL GRAPHIC SCALE

LEGEND:

━━━━	PROPERTY LINE
– – – –	RIGHT-OF-WAY LINE
——5820——	PROPOSED 5' CONTOUR
——5821——	PROPOSED 1' CONTOUR
– –5820– –	EXISTING 5' CONTOUR
– –5821– –	EXISTING 1' CONTOUR
▬▬▬▬	PROPOSED STORM LINE
▬▬▬▬	EXISTING STORM LINE
▣	PROPOSED STORM INLET
▣	EXISTING STORM INLET
■ ■ ■ ■	BASIN BOUNDARY
➜	EMERGENCY OVERFLOW PATH
△ X	DESIGN POINT
➜	FLOW DIRECTION
➜	EXISTING FLOW DIRECTION

BASIN DESIGNATION: X
AREA: X.XX AC.
5 YR "C" VALUE: X.XX
100 YR "C" VALUE: X.XX

WARE MALCOMB assumes no responsibility for utility locations. The utilities shown on this drawing have been plotted from the best available information. It is, however, the contractors responsibility to field verify the location of all utilities prior to the commencement of any construction.

TOWN OF CASTLE ROCK APPROVAL
PLANS ARE HEREBY APPROVED FOR ONE YEAR
FROM DATE OF DEVELOPMENT SERVICES APPROVAL

TOWN OF CASTLE ROCK COLORADO

DEVELOPMENT SERVICES DATE

WARE MALCOMB
CIVIL ENGINEERING & SURVEYING

900 south broadway
suite 320
denver, co 80209
p 303.561.3333
waremalcomb.com

FOR AND ON BEHALF
OF WARE MALCOMB

MEADOWS SENIOR HOUSING
PUBLIC IMPROVEMENT CONSTRUCTION PLANS
TIMBER MILL PARKWAY & N. MEADOWS DR.
CASTLE ROCK, CO 80109

DRAINAGE PLAN

NO.	DATE	REMARKS
1	10/12/2022	1ST CD SUBMITTAL

JOB NO.:	DCS22-4026
PA / PM:	T. SWAN
DESIGNED:	I.CONTRERAS
DATE:	08/15/2022
PLOT DATE:	12/09/22

SHEET
DR1

APPENDIX D:

EXCERPTS OF PHASE III DRAINGAE REPORT FOR THE MEADOWS FILING NO. 19 LOT 2 NORTH
PROJECT NO. CD21-0042

PHASE III DRAINAGE REPORT
FOR
The Meadows Filing No. 19 Lot 2 North
Castle Rock, CO
Project No. CD21-0042

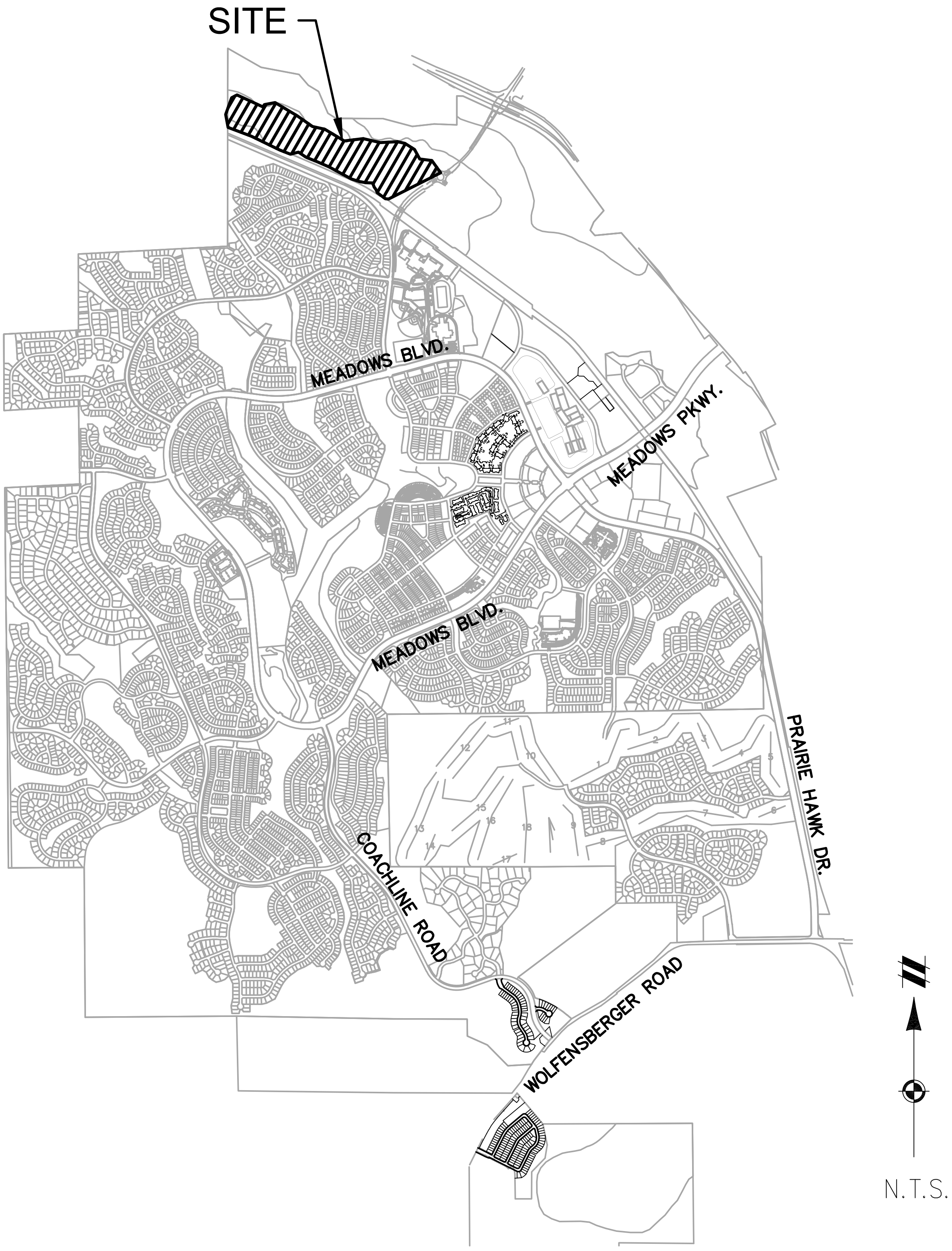
PREPARED FOR:

Castle Rock Development Co.
3033 E. 1st Ave. #310
Denver, Colorado 80206
303-394-5500
Contact: R.C Hanisch

PREPARED BY:

Terracina Design, LLC
10200 E. Girard Avenue
Building A, Suite 314
Denver, CO 80231
Phone: 303-632-8867
Contact: Martin Metsker, PE
Project Number: 14-003

February 2022



terracina design
10200 E. Girard Ave, A-314
Denver, CO 80231
ph: 303.632.8867

THE MEADOWS
FILING 19 – LOT 2 NORTH

DATE: 9/24/21

SHEET NUMBER
1
OF 1 SHEETS

JOB NUMBER
14–003

terracina design
10200 E. Girard Ave, A-314
Denver, CO 80231
ph. 303.632.8867

Project Name: Meadows Filing 19 Lot 2 North
Prepared By: MJG

Percent Impervious Calculations

		Total	Historic	Roof	Streets Paved	Gravel	
			2%	90%	100%	40%	
Basin Id	**Design Point**	**Total Basin Area**	**Area**	**Area**	**Area**	**Area**	**Weighted % Impervious**
A01	A01	2.22	0.00	2.22			90.0%
A02	A02	6.71	0.00	6.71			90.0%
A03	A03	0.48	0.08		0.40		83.2%
A04	A04	0.69	0.13		0.56		82.1%
A05	A05	2.65	0.00	2.65			90.0%
A06	A06	9.73	0.00	9.73			90.0%
A07	A07	7.59	0.00	7.59			90.0%
A08	A08	2.08	2.08				2.0%
A09	A09	0.49	0.12		0.37		76.4%
A10	A10	0.73	0.13		0.60		82.0%
B1	B1	7.75	0.00	7.75			90.0%
C1	C1	0.58	0.21		0.37		63.9%
C2	C2	0.82	0.19		0.64		77.9%
C3	C3	1.91	0.00	1.91			90.0%
C4	C4	2.00	0.00	2.00			90.0%
C5	C5	4.76	0.00	4.76			90.0%
C6	C6	0.95	0.00	0.28		0.68	54.5%
C7	C7	0.74	0.74				2.0%
C8	C8	1.35	0.34		1.00		75.0%
C9	C9	1.36	0.62		0.74		55.1%
CO1	CO1	4.56	2.49			2.07	19.3%
CO2	CO2	3.79	2.22			1.56	17.7%
D1	D1	4.80	0.66		0.37	3.77	39.4%
C10	C10	0.14	0.05		0.09		64.6%
C11	C11	0.09	0.03		0.06		65.5%

Project Name: **Meadows Filing 19 Lot 2 North**
Prepared By: **MJG**

Peak Runoff Rational Method (5-Year Event)

Rainfall Depth-Duration-Frequency (1-hr) = 1.43

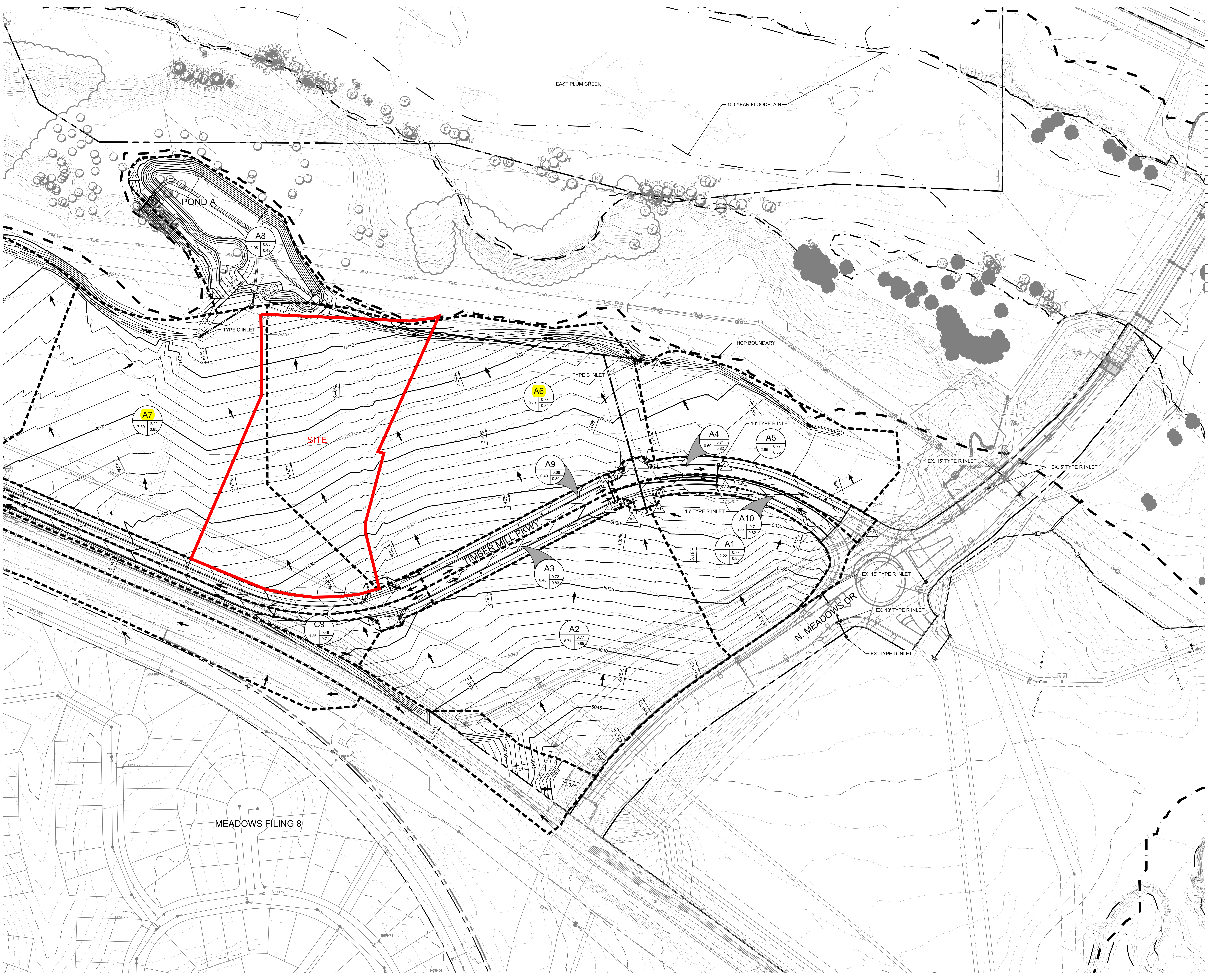
Design Point	Basin ID	Basin Area (Ac)	Runoff Coeff (5-Year)	T_c (min)	C X A	I (in/hr)	Q (cfs)
A01	A01	2.22	0.77	6.0	1.71	4.62	7.91
A02	A02	6.71	0.77	9.3	5.18	3.98	20.61
A03	A03	0.48	0.72	5.0	0.35	4.85	1.68
A04	A04	0.69	0.71	13.3	0.49	3.43	1.67
A05	A05	2.65	0.77	11.2	2.05	3.69	7.56
A06	A06	9.73	0.77	13.6	7.52	3.39	25.54
A07	A07	7.59	0.77	9.9	5.87	3.89	22.81
A08	A08	2.08	0.05	29.3	0.11	2.28	0.24
A09	A09	0.49	0.66	5.7	0.33	4.69	1.53
A10	A10	0.73	0.71	9.6	0.52	3.93	2.04
B1	B1	7.75	0.77	13.8	5.99	3.38	20.23
C1	C1	0.58	0.56	5.0	0.32	4.85	1.57
C2	C2	0.82	0.67	7.7	0.56	4.27	2.37
C3	C3	1.91	0.77	5.0	1.48	4.85	7.17
C4	C4	2.00	0.77	5.0	1.54	4.85	7.48
C5	C5	4.76	0.77	5.0	3.68	4.85	17.83
C6	C6	0.95	0.48	19.8	0.46	2.83	1.30
C7	C7	0.74	0.05	17.1	0.04	3.04	0.12
C8	C8	1.35	0.65	13.5	0.87	3.41	2.98
C9	C9	1.36	0.49	16.6	0.66	3.09	2.04
CO1	CO1	4.56	0.19	34.4	0.88	2.07	1.82
CO2	CO2	3.79	0.18	42.0	0.68	1.82	1.24
D1	D1	4.80	0.36	23.3	1.72	2.59	4.47
C10	C10	0.14	0.56	5.0	0.08	4.85	0.37
C11	C11	0.09	0.57	5.0	0.05	4.85	0.24

Project Name: Meadows Filing 19 Lot 2 North
Prepared By: MJG

Peak Runoff Rational Method (100-Year Event)

Rainfall Depth-Duration-Frequency (1-hr) = 2.60

Design Point	Basin ID	Basin Area (Ac)	Runoff Coeff (100-Year)	T_c (min)	C X A	I (in/hr)	Q (cfs)
A01	A01	2.22	0.85	6.0	1.89	8.39	15.87
A02	A02	6.7054	0.85300	9.3100	5.72	7.23	41.36
A03	A03	0.48	0.83	5.0	0.40	8.82	3.51
A04	A04	0.69	0.82	13.3	0.56	6.23	3.51
A05	A05	2.65	0.85	11.2	2.26	6.71	15.17
A06	A06	9.73	0.85	13.6	8.30	6.17	51.23
A07	A07	7.59	0.85	9.9	6.48	7.07	45.76
A08	A08	2.08	0.49	29.3	1.02	4.14	4.24
A09	A09	0.49	0.80	5.7	0.39	8.52	3.34
A10	A10	0.73	0.82	9.6	0.60	7.15	4.31
B1	B1	7.75	0.85	13.8	6.61	6.14	40.58
C1	C1	0.58	0.75	5.0	0.43	8.82	3.82
C2	C2	0.82	0.80	7.7	0.66	7.76	5.14
C3	C3	1.91	0.85	5.0	1.63	8.82	14.38
C4	C4	2.00	0.85	5.0	1.70	8.82	15.01
C5	C5	4.76	0.85	5.0	4.06	8.82	35.77
C6	C6	0.95	0.71	19.8	0.67	5.14	3.46
C7	C7	0.74	0.49	17.1	0.37	5.53	2.02
C8	C8	1.35	0.79	13.5	1.07	6.19	6.60
C9	C9	1.36	0.71	16.6	0.96	5.62	5.41
CO1	CO1	4.56	0.56	34.4	2.57	3.76	9.64
CO2	CO2	3.79	0.56	42.0	2.11	3.32	6.99
D1	D1	4.80	0.65	23.3	3.10	4.72	14.63
C10	C10	0.14	0.75	5.0	0.10	8.82	0.90
C11	C11	0.09	0.75	5.0	0.07	8.82	0.58



0 100' 200'
1 inch = 100 ft.

Project Name: Meadows Filing 19 Lot 2 North
Prepared By: MJG

Runoff Summary Table

Design Point	Basin ID	Basin Area	5-YEAR Runoff (CFS)	100-YEAR Runoff (CFS)
A01	A01	2.22	7.91	15.87
A02	A02	6.71	20.61	41.36
A03	A03	0.48	1.68	3.51
A04	A04	0.69	1.67	3.51
A05	A05	2.65	7.56	15.17
A06	A06	9.73	25.54	51.23
A07	A07	7.59	22.81	45.76
A08	A08	2.08	0.24	4.24
A09	A09	0.49	1.53	3.34
A10	A10	0.73	2.04	4.31
B1	B1	7.75	20.23	40.58
C1	C1	0.58	1.57	3.82
C2	C2	0.82	2.37	5.14
C3	C3	1.91	7.17	14.38
C4	C4	2.00	7.48	15.01
C5	C5	4.76	17.83	35.77
C6	C6	0.95	1.30	3.46
C7	C7	0.74	0.12	2.02
C8	C8	1.35	2.98	6.60
C9	C9	1.36	2.04	5.41
CO1	CO1	4.56	1.82	9.64
CO2	CO2	3.79	1.24	6.99
D1	D1	4.80	4.47	14.63
C10	C10	0.14	0.37	0.90
C11	C11	0.09	0.24	0.58

LEGEND:

▬ ▬ ▬	PROPERTY BOUNDARY LINE
– – –	PROPOSED EASEMENT
▬ ▬ ▬	EXISTING HCP BOUNDARY
	GRADING
—5530—	EXISTING MAJOR CONTOUR
– – –	EXISTING MINOR CONTOUR
—5530—	PROPOSED MAJOR CONTOUR
——	PROPOSED MINOR CONTOUR
	STORM DRAIN
▬●▬	MANHOLE and PIPE
▯▬	INLET
▷▬	FLARED END SECTION
	DRAINAGE
X, XX.X, X.XX, X.XX	EX BASIN DESIGNATION FROM REFERENCED REPORT
X	BASIN DESIGNATION
BASIN AREA XX.X, X.XX, X.XX	5 YEAR COEFFICIENTS 100 YEAR COEFFICIENTS
▬ ▬ ▬	BASIN BOUNDARY
←	DIRECTIONAL FLOW ARROW
⇦	EMERGENCY OVERFLOW PATH
△1	DESIGN POINT

terracina design
10200 E. Girard Ave, A-314
Denver, CO 80231
ph: 303.632.8867

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811

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

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#	REVISION DESCRIPTION	DATE	BY

THE MEADOWS
TOWN OF CASTLE ROCK, COLORADO

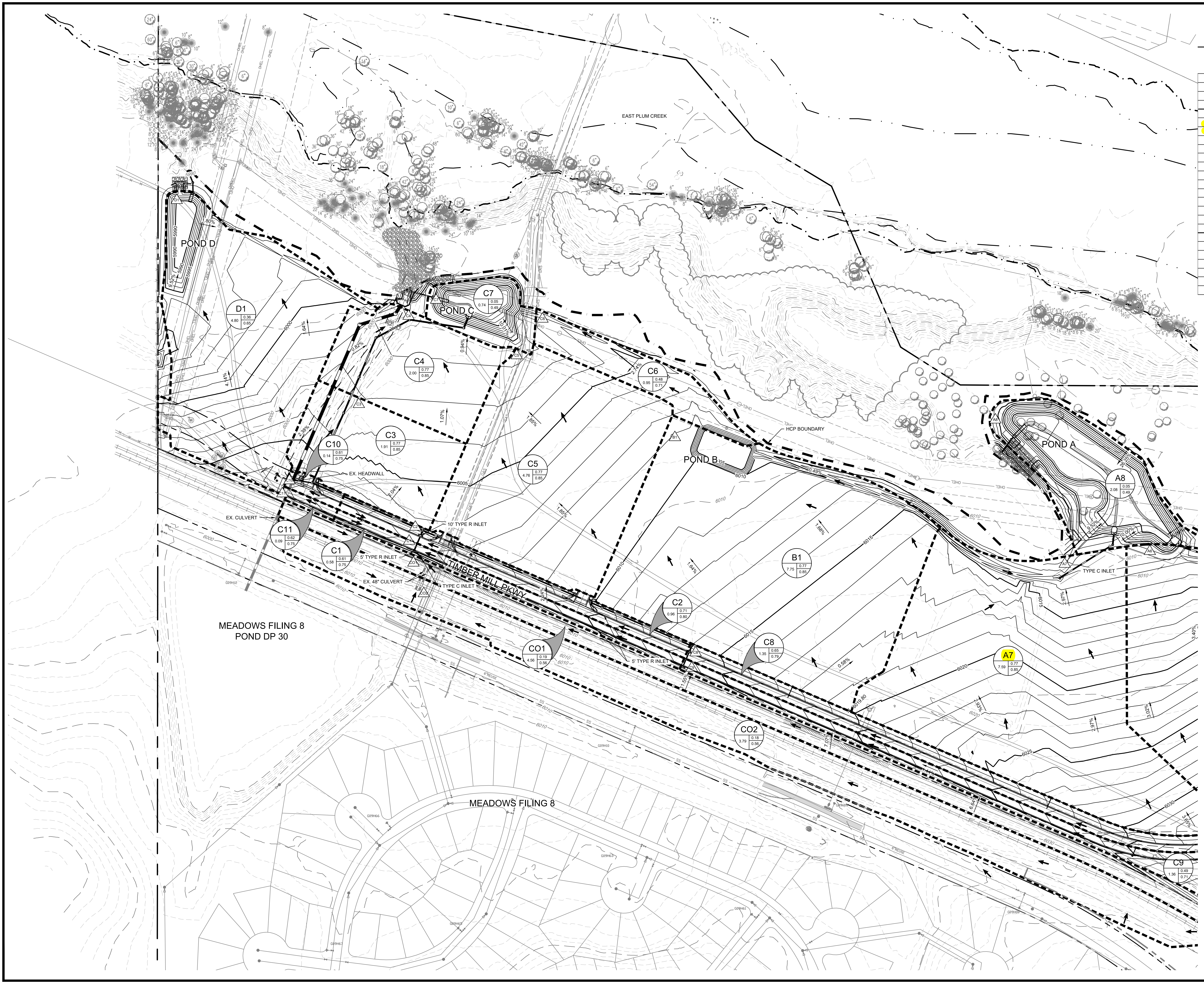
MEADOWS FILING 19 LOT 2 NORTH
DRAINAGE PLAN

DESIGNED BY: DB
DRAWN BY: DB
CHECKED BY: MM

JOB NO.
14-003

SHEET
1 OF 2

2/3/2022 11:39 AM : X:\14-003 MEADOWS\DOCUMENTS\FILING 19\DRAINAGE REPORT - LOT 2 NORTH\1 - DRAINAGE MAP.DWG;



Project Name: Meadows Filing 19 Lot 2 North
Prepared By: MJG

Runoff Summary Table

Design Point	Basin ID	Basin Area	5-YEAR Runoff (CFS)	100-YEAR Runoff (CFS)
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A03	A03	0.48	1.68	3.51
A04	A04	0.69	1.67	3.51
A05	A05	2.65	7.56	15.17
A06	A06	9.73	25.54	51.23
A07	A07	7.59	22.81	45.76
A08	A08	2.08	0.24	4.24
A09	A09	0.49	1.53	3.34
A10	A10	0.73	2.04	4.31
B1	B1	7.75	20.23	40.58
C1	C1	0.58	1.57	3.82
C2	C2	0.82	2.37	5.14
C3	C3	1.91	7.17	14.38
C4	C4	2.00	7.48	15.01
C5	C5	4.76	17.83	35.77
C6	C6	0.95	1.30	3.46
C7	C7	0.74	0.12	2.02
C8	C8	1.35	2.98	6.60
C9	C9	1.36	2.04	5.41
CO1	CO1	4.56	1.82	9.64
CO2	CO2	3.79	1.24	6.99
D1	D1	4.80	4.47	14.63
C10	C10	0.14	0.37	0.90
C11	C11	0.09	0.24	0.58

0 100' 200'
1 inch = 100 ft.

LEGEND:

PROPERTY BOUNDARY LINE
PROPOSED EASEMENT
EXISTING HCP BOUNDARY

GRADING
5530 EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
5530 PROPOSED MAJOR CONTOUR
PROPOSED MINOR CONTOUR

STORM DRAIN
MANHOLE and PIPE
INLET
FLARED END SECTION

DRAINAGE
X XX.X X.XX X.XX EX BASIN DESIGNATION FROM REFERENCED REPORT
X BASIN DESIGNATION
BASIN AREA XX.X X.XX 5 YEAR COEFFICIENTS
X.XX 100 YEAR COEFFICIENTS
BASIN BOUNDARY
← DIRECTIONAL FLOW ARROW
⇦ EMERGENCY OVERFLOW PATH
△1 DESIGN POINT

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#	REVISION DESCRIPTION	DATE	BY

THE MEADOWS
TOWN OF CASTLE ROCK, COLORADO

MEADOWS FILING 19 LOT 2 NORTH
DRAINAGE PLAN

DESIGNED BY: DB
DRAWN BY: DB
CHECKED BY: MM

JOB NO.
14-003

SHEET
2 OF 2

2/3/2022 11:41 AM : X:\14-003 MEADOWS\DOCUMENTS\FILING 19\DRAINAGE REPORT - LOT 2 NORTH\1 - DRAINAGE MAP.DWG;