DRAINAGE REPORT

Scottsdale UMC Multifamily Multi-Family Development

Parcel 173-52-001A
4140 North Miller Road
Scottsdale, AZ 85251

RICK Job No. 7251
April 28, 2026

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DRAINAGE REPORT
COS#: 14-DR-2025

Prepared For:
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April 28, 2026

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JOB NUMBER 7251

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I. INTRODUCTION

1. PROJECT NAME AND LOCATION

The Project is known as 'Scottsdale UMC Multifamily' and is located at 4140 N Miller Road in Scottsdale, Arizona.

The Project site occupies approximately 4.49 acres and is currently a developed parcel. The Project has street frontage and access to N Miller Road along the eastern boundary and N 75th Street along the western boundary. To the north is a condominium complex and to the south are commercial developments. Refer to Appendix A for Location Map and Aerial Photo. The area has slopes consistently and gently to the east with average slopes in the range of 0.5% and 1.0%.

The Project consists of the construction of consists of two new buildings that make up an 83-unit multifamily residential housing complex and associated paved parking, fire system and drainage infrastructure.

2. PURPOSE

The intent of this Drainage Report is to provide the drainage scheme for the Project in support of the Preliminary Improvement Plan Submittal.

3. EXISTING STUDIES & REGIONAL DRAINAGE PLAN

No existing or regional drainage studies were located for the area.

4. FEMA FLOOD ZONE

According to the Federal Emergency Management Agency Flood Insurance Rate Map Panel Number 04013C2235M, dated September 18 2020, the Parcel is located in the Zone X (unshaded) area, which is defined as an area of minimal flood hazard. Refer to Appendix B for FEMA FIRM Map.

II. EXISTING DRAINAGE INFRASTRUCTURE

1. OFFSITE

According to a recent topographic survey and field investigations the Project is not impacted by offsite runoff. Runoff generated by N Miller Road flows south within the right-of-way and is intercepted by an existing City of Scottsdale curb inlet located at the northwest corner of E Indian School Road and N Miller Road. Runoff generated by N 75th Street flows south within the right-of-way and is eventually intercepted by a City of Scottsdale curb inlet located at the northeast corner of E Indian School Road.

2. **ONSITE**

There is no existing retention infrastructure located onsite. Runoff generated by the southern portion of the existing site is conveyed onto N Miller Road as shallow sheet flow through the existing alley.

Runoff generated by the norther portion of the site is conveyed to an existing onsite catch basin that further conveys runoff to the existing 24" storm drain pipe within the N Miller Road right-of-way. This existing catch basin is easily inundated before the peak flow. The peak flow is then released from the site at the northern access onto N Miller Road.

III. PROPOSED DRAINAGE INFRASTRUCTURE

1. CONVEYANCE OF RUNOFF

In the developed condition, the site is divided into a series of 9 drainage areas (DA) based on proposed grading. DA1 through DA9 consist of parking lot, buildings, landscape, and various amenity areas. Runoff from DA1, DA2, and DA4-DA9 is conveyed as shallow sheet flow to a series of catch basins that are connected via a storm drain system that outfalls to a new StormTech underground chamber system. When the chamber system is full, runoff will surcharge out of the catch basin in DA9 and exit the site at the northern access on Miller Road.

Runoff from DA3 is conveyed as shallow sheet flow to the southeast corner of the site and outfalls to Miller Road's right of way. This runoff is then collected by an existing City of Scottsdale catch basin located south of the project that enters the same 24" storm drain pipe as mentioned prior.

The pre construction peak flow generated onsite that is exiting the site is 29.8 cfs. The post construction peak flow generated onsite that is exiting the site onto Miller Road is 23.1 cfs. Hydrographs have been prepared to model the rate of the runoff generated onsite exiting the site. There are three hydrographs to express the proposed condition. The DA9 hydrograph is modeling the discharge from the northern portion of the site (DA1,2,4-9), the DA3 hydrograph is modeling the discharge from the southern portion of the site, and the two are added to together in the Proposed Site hydrograph to express the total discharge leaving the site. Timestep 0-16.8 minutes in the DA 9 hydrograph is highlighted in yellow to show the volume of runoff that is stored onsite in underground storage, and will not contribute to the discharge to Miller Road. Timestep 18 minutes and onward, the underground storage will be full and all runoff generated onsite will be discharged to Miller Road.

Refer to Appendix C for the Proposed Watershed Map, Appendix D for Drainage Calculations, and Appendix E for Discharge Hydrographs.

2. STORM WATER RETENTION

Per the City of Scottsdale Design Standards & Policies Manual, Chapter 4, C-1-b, sites that have been previously developed, or portions of a site thereof, shall be required to retain a volume equal to the Pre vs Post retention volume. For all portions of the site remaining unchanged, no retention volume is proposed.

The project site is also required to store the first flush (0.5" depth) per City MS4 standards. The volume to store the first flush is provided underground StormTech MC-7200 chambers. The runoff stored in these chambers shall be dissipated via one new drywell. The number of drywells may need to be increased during construction based on the results of percolation/infiltration testing conducted in the field. There is a proposed drainage easement to be dedicated around the stormwater storage facility and a proposed access easement in the parking lot to connect the proposed drainage easement to the Miller Road right-of-way.

The existing topography and existing easements of the alley make it difficult to capture runoff in the existing alley at the south end of the site (DA3). The alley was originally designed to convey runoff east to Miller Road, and we are unable to alter the existing drainage pattern.

Refer to Appendix D for Drainage Calculations.

3. FINISHED FLOOR ELEVATION

The northern new building has a finished floor elevation of 1250.00. This was set via being 12" higher than the adjacent high curb of 1249.00. The southern new building has a finished floor elevation of 1249.30. This was set via being 12" higher than the adjacent high curb of 1248.30.

In addition, according to Maricopa County Flo2D Modeling, there is flow being conveyed through the Project. Along the north side of the site, there are 2 concentration points that we have reviewed and analyzed through the Project site:

Cross Section A – 3.18 cfs total
Cross Section B – 8.04 cfs total

In the center of the site, flow moves through the existing courtyard and this will be improved with the removal of the building south of the flow:

Cross Section C – 6.87 cfs total

Existing the parking lot toward the south is an additional concentration of flow that currently flows along the east side of the existing building to be removed:

Cross Section D – 4.51 cfs total

The cross section analysis and water surface elevation information included in Appendix D, Drainage Calculations. The FFEs exceed the analyzed high water elevations in this conservative analysis. A new retention system and new storm drain conveyance will relieve the impact of the Flo2d modeled flow.

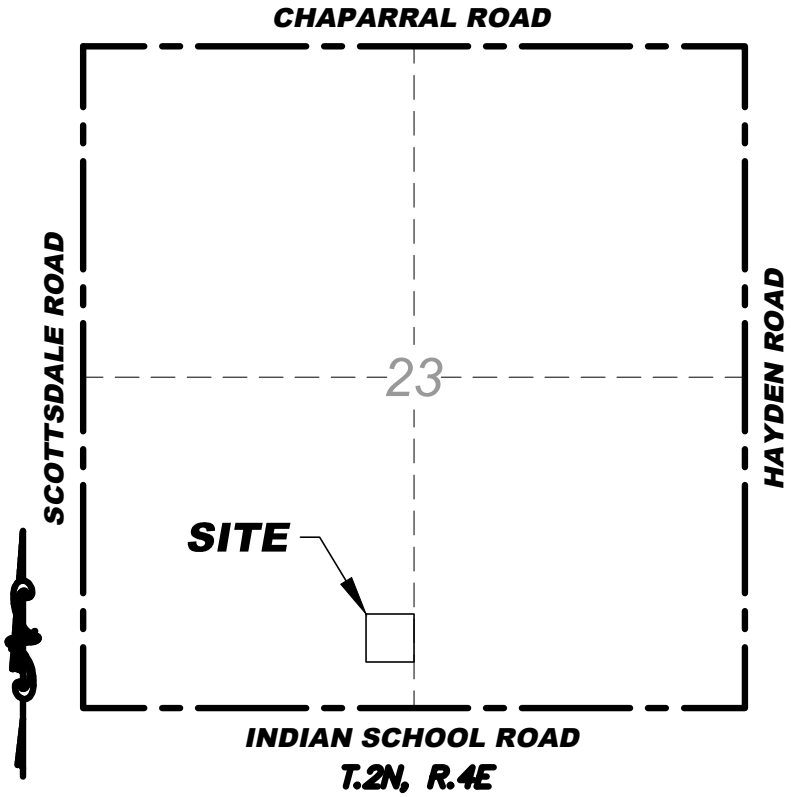
It should be noted that the Flo2d analysis does not take into account roadway curbs and site walls that permit theoretical flow to combine and concentrate in the model in ways that will not happen in practice. Flow from development to the north is shown being conveyed into the Project site however, there is no physical way that could happen. In addition, flow is pushed through courtyards in the center of the site with no respect for parking lot curbing or stormdrain piping. This further substantiates the depiction that our cross section analysis and setting of finished floors to exceed the modeled flow is a very conservative approach in this specific case.

IV. SUMMARY AND CONCLUSION

This Drainage Report is to accompany the Preliminary Improvement Plan submittal for the Scottsdale UMC Multifamily development project. The Project is designed to convey the 100-year storm event to the existing City of Scottsdale infrastructure. This Report was written utilizing generally accepted engineering practices and all information herein has been researched through archived documents and all calculations were accomplished through applying the City of Scottsdale Design

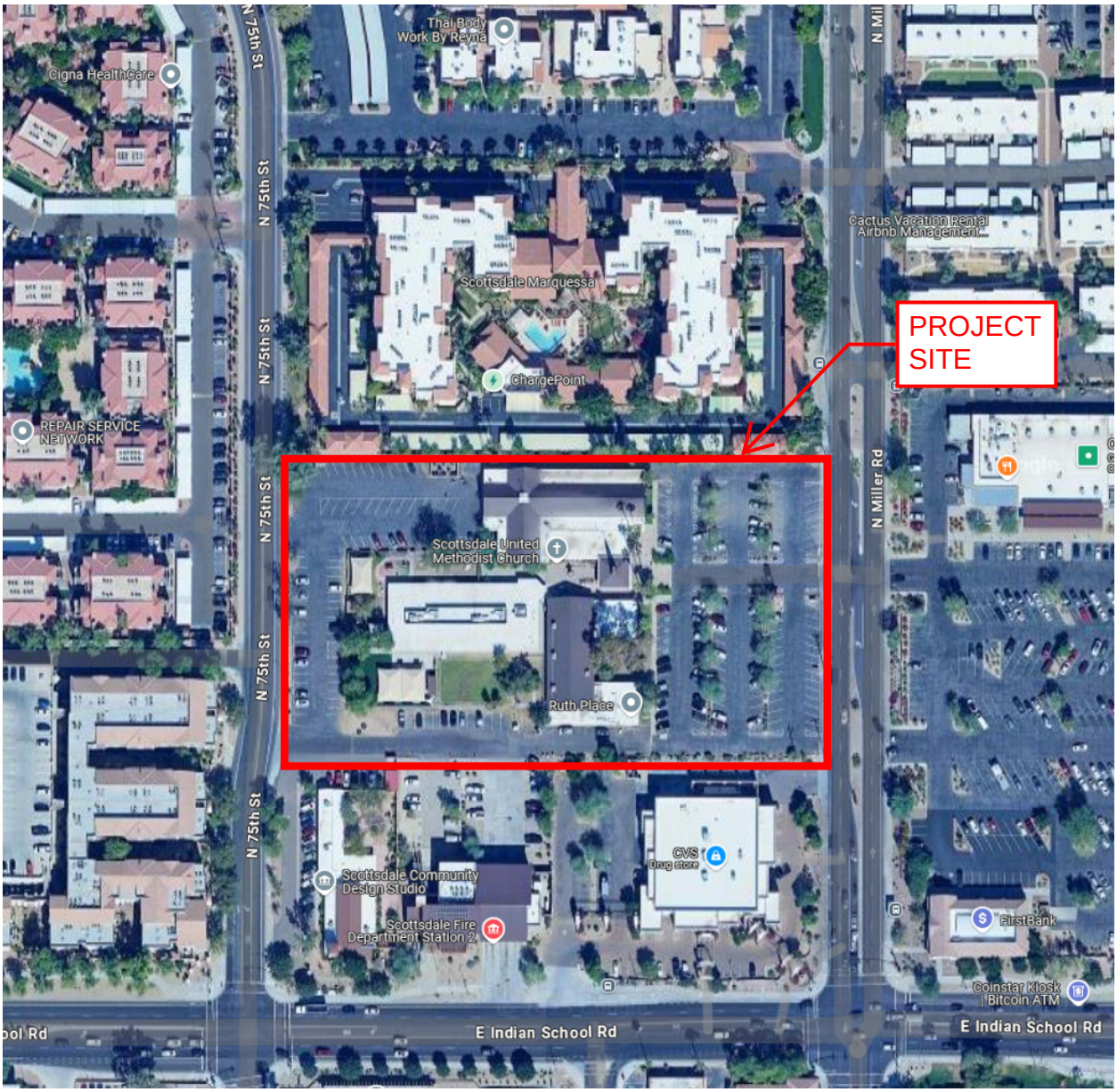
Standards & Policies Manual and the Hydrology/Hydraulic Manual published by the Maricopa County Flood Control District.

APPENDIX A
(Location Map + Aerial Photo)



VICINITY MAP

N.T.S.


PROJECT SITE
Thai Body Work By Reyna
Cigna Healthcare
N 75th St
N 75th St
N 75th St
N 75th St
N 75th St
N Miller Rd
Cactus Vacation Rental Airbnb Management
Scottsdale Marquessa
ChargePoint
REPAIR SERVICE NETWORK
Scottsdale United Methodist Church
Ruth Place
Scottsdale Community Design Studio
Scottsdale Fire Department Station 2
CVS Drug store
FirstBank
Coinstar Kiosk | Bitcoin ATM
E Indian School Rd
E Indian School Rd

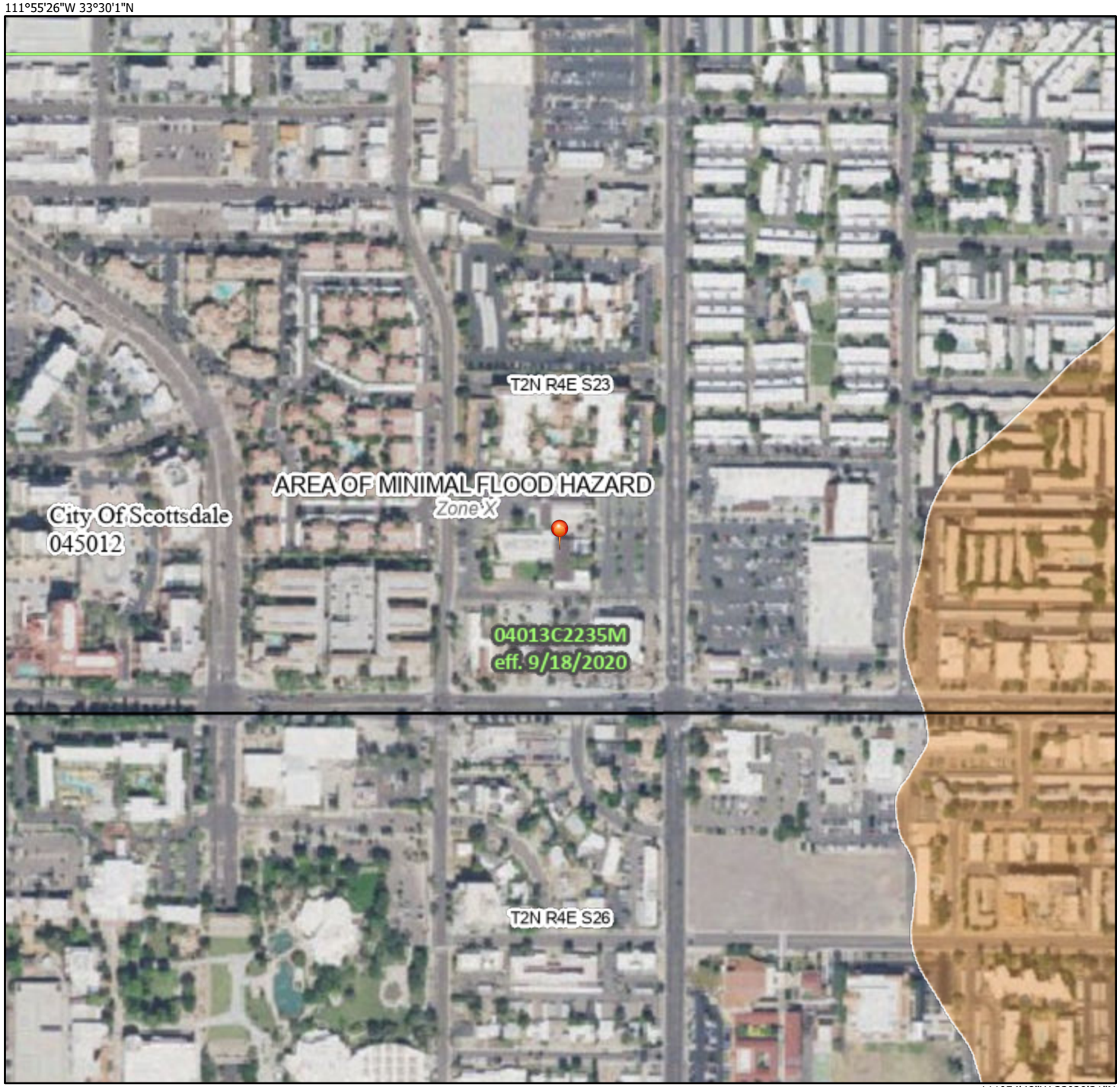
AERIAL MAP

APPENDIX B
(FEMA FIRM Map)

National Flood Hazard Layer FIRMette

FEMA

111°55'26"W 33°30'1"N



111°54'48"W 33°29'31"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

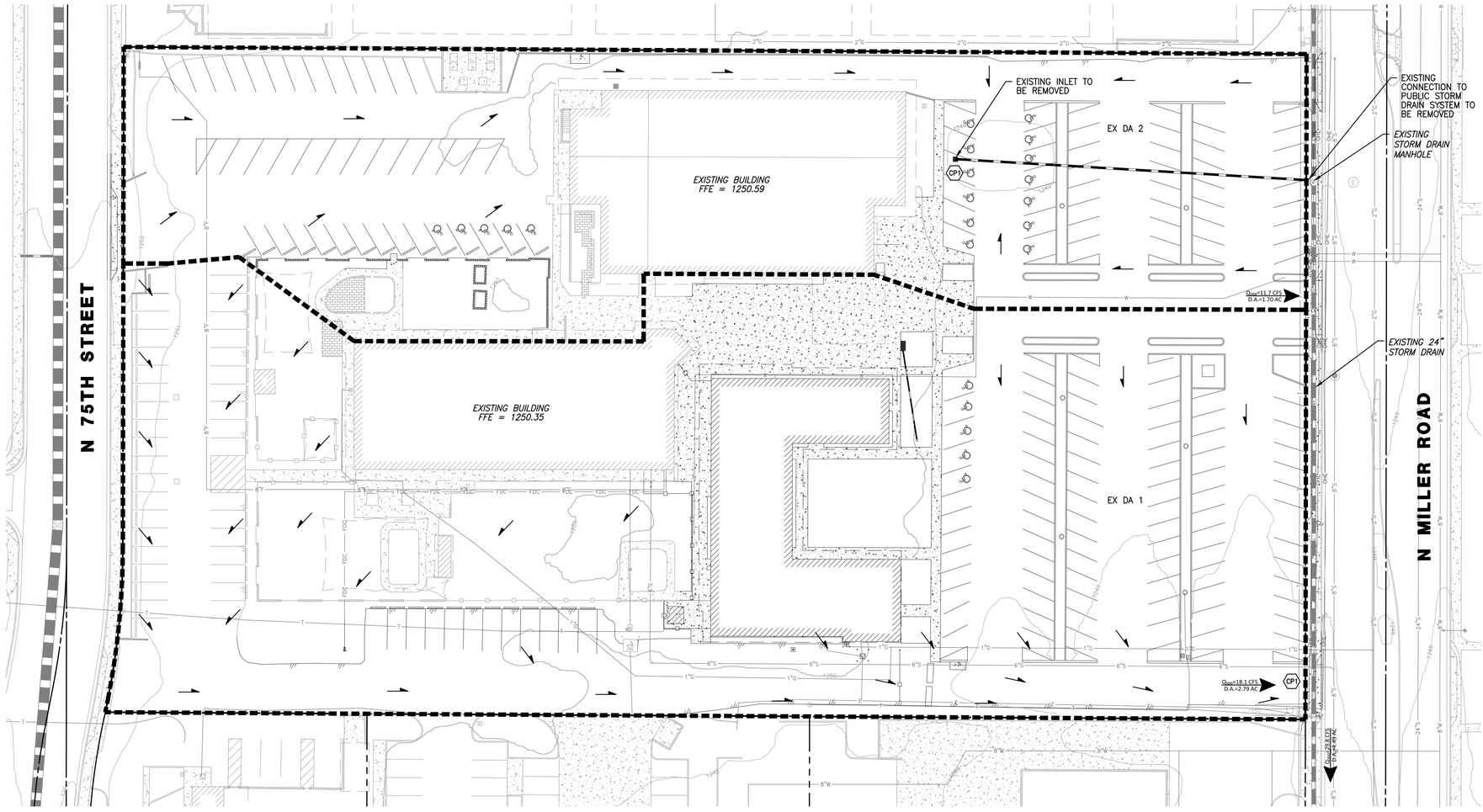
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/16/2024 at 11:05 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX C
(Proposed Watershed Map)



LEGEND

- EXISTING RIGHT-OF-WAY
- PROJECT/NEW PROPERTY LINE
- ROADWAY CENTERLINE
- FLOW ARROW
- WATERSHED BOUNDARY
- CP1 CONCENTRATION POINT
- EXISTING STORM DRAIN PIPE
- NEW STORM DRAIN PIPE
- 1250 EXISTING CONTOUR
- 1200 NEW CONTOUR
- FLOW-LINE

WATERSHED CONCENTATION POINTS

ID	AREA	Q 100
CP1	1.70 AC	11.7 CFS
CP2	2.79 AC	18.1 CFS

N

30 15 0 30 60

GRAPHIC SCALE: 1"=30'

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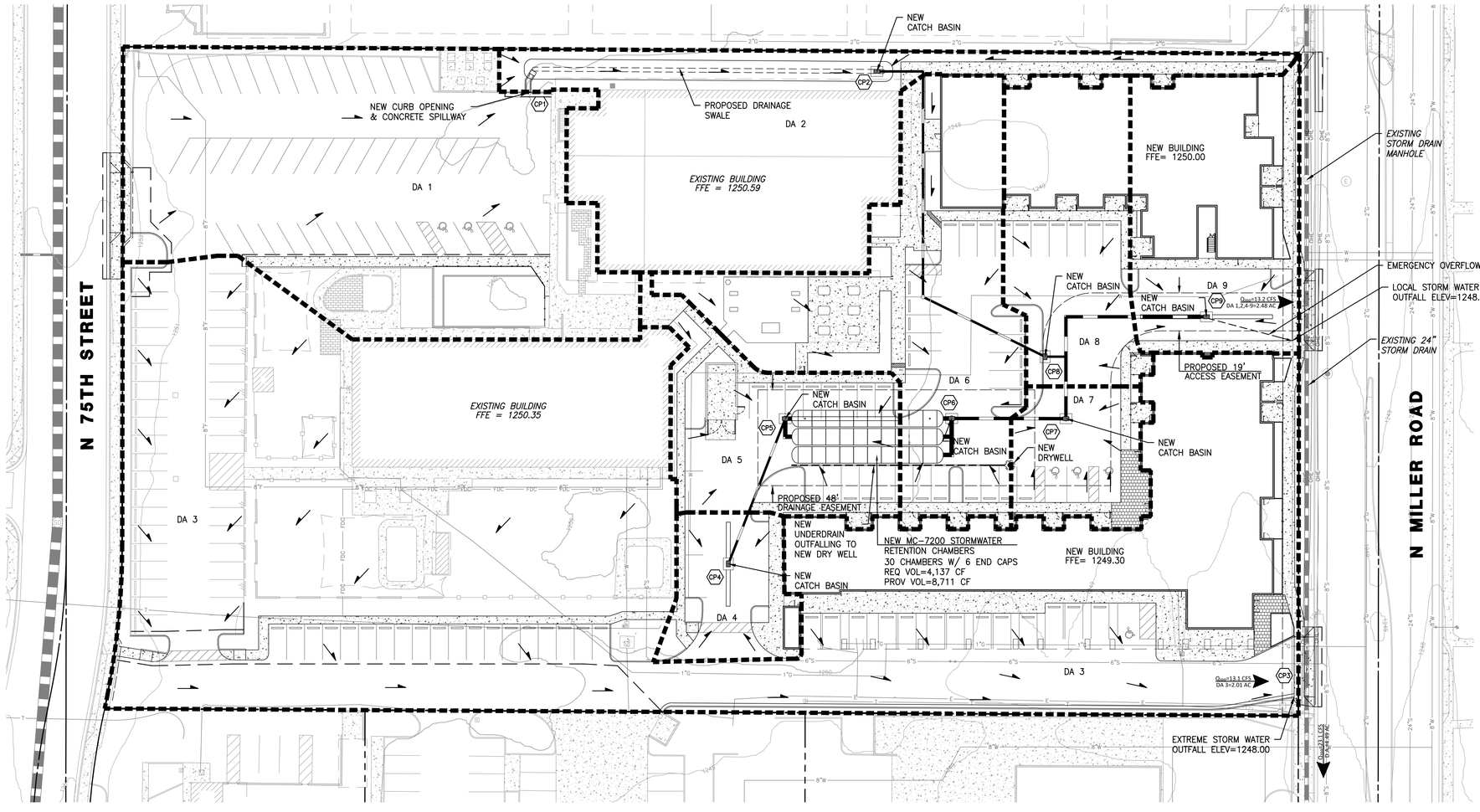
PROJECT NO: 7251

SCOTTSDALE UMC MULTIFAMILY

EXISTING CONDITIONS HYDROLOGY MAP

DRAWING NO.

SHEET NO. 1 OF 1



LEGEND

- EXISTING RIGHT-OF-WAY
- PROJECT/NEW PROPERTY LINE
- ROADWAY CENTERLINE
- FLOW ARROW
- WATERSHED BOUNDARY
- CONCENTRATION POINT
- EXISTING STORM DRAIN PIPE
- NEW STORM DRAIN PIPE
- EXISTING CONTOUR
- NEW CONTOUR
- FLOW-LINE

WATERSHED CONCENTATION POINTS

ID	AREA	Q 100
CP1	0.69 AC	4.6 CFS
CP2	0.47 AC	3.2 CFS
CP3	2.01 AC	13.1 CFS
CP4	0.10 AC	0.7 CFS
CP5	0.22 AC	1.6 CFS
CP6	0.41 AC	2.9 CFS
CP7	0.10 AC	0.8 CFS
CP8	0.22 AC	1.6 CFS
CP9	0.27 AC	2.0 CFS

N

30 15 0 30 60

GRAPHIC SCALE: 1"=30'

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PROJECT NO: 7251

SCOTTSDALE UMC MULTIFAMILY

PROPOSED CONDITIONS HYDROLOGY MAP

DRAWING NO.

SHEET NO. 1 OF 1

LEGEND

- EXISTING RIGHT–OF–WAY
- PROJECT/NEW PROPERTY LINE
- ROADWAY CENTERLINE
- FLOW ARROW
- WATERSHED BOUNDARY
- CP5 CONCENTRATION POINT
- EXISTING STORM DRAIN PIPE
- NEW STORM DRAIN PIPE
- 1255 EXISTING CONTOUR
- 1260 NEW CONTOUR
- FLOW–LINE

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PROJECT NO: 7251

SCOTTSDALE UMC MULTIFAMILY

PROPOSED CONDITIONS WITH COUNTY FLO2D

N

30 15 0 30 60

GRAPHIC SCALE: 1"=30'

DRAWING NO.

SHEET NO. 1 OF 1

RICK

EXISTING WATERSHED SUMMARY

PROJECT SCOTTSDALE UMC MULTIFAMILY

WATERSHED ID	CONCENTRATION POINT	AREA ROOF + PAVEMENT C= 0.95 (SF)	AREA LANDSCAPING C= 0.50 (SF)	TOTAL AREA (AC)	WEIGHTED 'C'
ONSITE					
DA1	1	68,680	5,500	1.70	0.92
DA2	2	98,916	22,500	2.79	0.87

RICK

PROPOSED WATERSHED SUMMARY

PROJECT SCOTTSDALE UMC MULTIFAMILY

WATERSHED ID	CONCENTRATION POINT	AREA ROOF + PAVEMENT C= 0.95 (SF)	AREA LANDSCAPING C= 0.50 (SF)	TOTAL AREA (AC)	WEIGHTED 'C'
ONSITE					
DA1	1	26,152	4,000	0.69	0.89
DA2	2	18,107	2,500	0.47	0.90
DA3	3	72,477	15,000	2.01	0.87
DA4	4	4,242	200	0.10	0.93
DA5	5	9,196	200	0.22	0.94
DA6	6	17,472	300	0.41	0.94
DA7	7	4,439	100	0.10	0.94
DA8	8	9,271	250	0.22	0.94
DA9	9	11,640	50	0.27	0.95

APPENDIX D
(Drainage Calculations)

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.4962°, Longitude: -111.9186°
Elevation: 1250 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**2.21** (1.85-2.70)	**2.88** (2.42-3.53)	**3.92** (3.28-4.76)	**4.72** (3.91-5.70)	**5.80** (4.73-6.96)	**6.62** (5.34-7.93)	**7.46** (5.90-8.92)	**8.34** (6.48-9.94)	**9.49** (7.18-11.3)	**10.4** (7.69-12.4)
10-min	**1.68** (1.40-2.05)	**2.20** (1.85-2.68)	**2.98** (2.49-3.62)	**3.59** (2.98-4.34)	**4.41** (3.59-5.30)	**5.04** (4.06-6.04)	**5.68** (4.49-6.79)	**6.35** (4.93-7.56)	**7.22** (5.47-8.62)	**7.90** (5.86-9.44)
15-min	**1.39** (1.16-1.69)	**1.82** (1.53-2.21)	**2.46** (2.06-3.00)	**2.96** (2.46-3.58)	**3.64** (2.97-4.38)	**4.16** (3.36-4.98)	**4.70** (3.71-5.61)	**5.24** (4.07-6.25)	**5.97** (4.52-7.12)	**6.52** (4.84-7.80)
30-min	**0.934** (0.782-1.14)	**1.22** (1.03-1.49)	**1.66** (1.39-2.02)	**2.00** (1.66-2.41)	**2.45** (2.00-2.95)	**2.80** (2.26-3.36)	**3.16** (2.50-3.78)	**3.53** (2.74-4.21)	**4.02** (3.04-4.80)	**4.39** (3.26-5.25)
60-min	**0.578** (0.484-0.706)	**0.756** (0.636-0.922)	**1.03** (0.858-1.25)	**1.24** (1.02-1.49)	**1.52** (1.24-1.82)	**1.74** (1.40-2.08)	**1.96** (1.55-2.34)	**2.18** (1.70-2.60)	**2.49** (1.88-2.97)	**2.72** (2.02-3.25)
2-hr	**0.335** (0.285-0.400)	**0.433** (0.369-0.520)	**0.580** (0.492-0.691)	**0.692** (0.580-0.823)	**0.845** (0.700-0.999)	**0.962** (0.787-1.14)	**1.08** (0.872-1.28)	**1.21** (0.954-1.42)	**1.37** (1.06-1.62)	**1.50** (1.13-1.78)
3-hr	**0.243** (0.206-0.293)	**0.312** (0.265-0.378)	**0.410** (0.346-0.494)	**0.487** (0.408-0.585)	**0.596** (0.492-0.710)	**0.682** (0.556-0.811)	**0.773** (0.618-0.918)	**0.867** (0.682-1.03)	**0.998** (0.760-1.18)	**1.10** (0.820-1.31)
6-hr	**0.146** (0.127-0.173)	**0.186** (0.161-0.219)	**0.238** (0.206-0.280)	**0.280** (0.239-0.327)	**0.337** (0.284-0.391)	**0.382** (0.317-0.442)	**0.428** (0.351-0.496)	**0.476** (0.382-0.552)	**0.541** (0.424-0.628)	**0.592** (0.453-0.690)
12-hr	**0.081** (0.071-0.094)	**0.102** (0.089-0.119)	**0.130** (0.113-0.151)	**0.151** (0.131-0.175)	**0.181** (0.154-0.208)	**0.203** (0.171-0.233)	**0.226** (0.188-0.260)	**0.249** (0.205-0.287)	**0.281** (0.225-0.325)	**0.305** (0.240-0.355)
24-hr	**0.048** (0.043-0.054)	**0.061** (0.055-0.069)	**0.080** (0.071-0.090)	**0.094** (0.083-0.106)	**0.114** (0.100-0.129)	**0.130** (0.113-0.146)	**0.146** (0.127-0.165)	**0.163** (0.141-0.184)	**0.187** (0.159-0.210)	**0.206** (0.173-0.232)
2-day	**0.026** (0.023-0.029)	**0.033** (0.029-0.037)	**0.044** (0.039-0.049)	**0.052** (0.046-0.059)	**0.064** (0.056-0.072)	**0.073** (0.064-0.082)	**0.083** (0.072-0.093)	**0.093** (0.080-0.105)	**0.107** (0.092-0.121)	**0.119** (0.100-0.135)
3-day	**0.018** (0.016-0.020)	**0.023** (0.021-0.026)	**0.031** (0.027-0.035)	**0.037** (0.032-0.041)	**0.045** (0.040-0.051)	**0.052** (0.045-0.058)	**0.059** (0.051-0.067)	**0.067** (0.057-0.075)	**0.077** (0.066-0.087)	**0.086** (0.072-0.097)
4-day	**0.014** (0.013-0.016)	**0.018** (0.016-0.021)	**0.024** (0.021-0.027)	**0.029** (0.026-0.033)	**0.036** (0.032-0.040)	**0.041** (0.036-0.047)	**0.047** (0.041-0.053)	**0.054** (0.046-0.060)	**0.063** (0.053-0.070)	**0.070** (0.058-0.079)
7-day	**0.009** (0.008-0.010)	**0.011** (0.010-0.013)	**0.015** (0.013-0.017)	**0.018** (0.016-0.021)	**0.023** (0.020-0.026)	**0.026** (0.023-0.029)	**0.030** (0.026-0.034)	**0.034** (0.029-0.038)	**0.039** (0.033-0.044)	**0.044** (0.037-0.050)
10-day	**0.007** (0.006-0.007)	**0.009** (0.008-0.010)	**0.011** (0.010-0.013)	**0.014** (0.012-0.016)	**0.017** (0.015-0.019)	**0.020** (0.017-0.022)	**0.022** (0.019-0.025)	**0.025** (0.022-0.028)	**0.029** (0.025-0.033)	**0.033** (0.027-0.037)
20-day	**0.004** (0.003-0.004)	**0.005** (0.004-0.006)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.010** (0.009-0.011)	**0.011** (0.010-0.013)	**0.013** (0.011-0.014)	**0.014** (0.012-0.016)	**0.016** (0.014-0.018)	**0.018** (0.015-0.020)
30-day	**0.003** (0.003-0.003)	**0.004** (0.003-0.004)	**0.005** (0.005-0.006)	**0.006** (0.006-0.007)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.010** (0.009-0.011)	**0.011** (0.010-0.012)	**0.013** (0.011-0.014)	**0.014** (0.012-0.015)
45-day	**0.002** (0.002-0.002)	**0.003** (0.003-0.003)	**0.004** (0.003-0.004)	**0.005** (0.004-0.005)	**0.006** (0.005-0.006)	**0.007** (0.006-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)	**0.009** (0.008-0.010)	**0.010** (0.009-0.011)
60-day	**0.002** (0.001-0.002)	**0.002** (0.002-0.003)	**0.003** (0.003-0.004)	**0.004** (0.003-0.004)	**0.005** (0.004-0.005)	**0.005** (0.005-0.006)	**0.006** (0.005-0.007)	**0.006** (0.006-0.007)	**0.007** (0.006-0.008)	**0.008** (0.007-0.009)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

RICK

RATIONAL METHOD - EXISTING

PROJECT SCOTTSDALE UMC MULTIFAMILY

$$T_C = 11.4L^{0.5}K_b^{52}S^{-0.31}i^{-0.38} \times 60$$

$$Q = CiA$$

Tc= Time of Concentration (min)
L= Length of longest flow path (miles)
Kb= Watershed resistance coefficient
S= Watercourse slope (ft/mi)
i= rainfall intensity (in/hr)

Q = Peak discharge (cfs)
C = Runoff coefficient
i = Rainfall intensity (inch/hr)
A = Drainage area (Acres)

100-YR, 5-MIN	7.46	in/hr
100-YR, 10-MIN	5.68	in/hr
100-YR, 15-MIN	4.70	in/hr
100-YR, 30-MIN	3.16	in/hr

WATERSHED ID	CONCENTRATION POINT	L	Kb	S		i	Tc	C	i	A	Q
EX DA 1	1	0.04	0.04	25	0.5%	7.46	4.3	0.92	7.46	1.70	11.7
EX DA 2	2	0.06	0.04	15	0.3%	7.46	6.2	0.87	7.46	2.79	18.1

RICK

RATIONAL METHOD - PROPOSED

PROJECT SCOTTSDALE UMC MULTIFAMILY

$$T_C = 11.4L^{0.5}K_b^{.52}S^{-0.31}i^{-0.38} \times 60 \qquad Q = CiA$$

Tc= Time of Concentration (min)
L= Length of longest flow path (miles)
Kb= Watershed resistance coefficient
S= Watercourse slope (ft/mi)
i= rainfall intensity (in/hr)

Q = Peak discharge (cfs)
C = Runoff coefficient
i = Rainfall intensity (inch/hr)
A = Drainage area (Acres)

100-YR, 5-MIN	7.46	in/hr
100-YR, 10-MIN	5.68	in/hr
100-YR, 15-MIN	4.70	in/hr
100-YR, 30-MIN	3.16	in/hr

WATERSHED ID	CONCENTRATION POINT	L	Kb	S		i	Tc	C	i	A	Q
DA 1	1	0.04	0.04	25	0.5%	7.46	4.3	0.89	7.46	0.69	4.6
DA 2	2	0.06	0.04	15	0.3%	7.46	6.2	0.90	7.46	0.47	3.2
DA 3	3	0.04	0.04	55	1.0%	7.46	3.5	0.87	7.46	2.01	13.1
DA 4	4	0.04	0.04	55	1.0%	7.46	3.5	0.93	7.46	0.10	0.7
DA 5	5	0.04	0.04	105	2.0%	7.46	2.8	0.94	7.46	0.22	1.6
DA 6	6	0.04	0.04	160	3.0%	7.46	2.5	0.94	7.46	0.41	2.9
DA 7	7	0.04	0.04	25	0.5%	7.46	4.4	0.94	7.46	0.10	0.8
DA 8	8	0.04	0.04	160	3.0%	7.46	2.5	0.94	7.46	0.22	1.6
DA 9	9	0.04	0.04	25	0.5%	7.46	4.4	0.95	7.46	0.27	2.0

RICK

RETENTION VOLUME

PROJECT SCOTTSDALE UMC MULTIFAMILY

$$V = \left(\frac{P}{12}\right) \times A \times C$$

V= Volume (cubic feet)
P= NOAA Depth of Rainfall (First Flush) = 0.50 (inches)
A= Area of watershed (square feet)
C= Weighted C Value

ONSITE

WATERSHED ID	AREA	WEIGHTED C	VOLUME REQUIRED	VOLUME PROVIDED
DA1	30,152	0.89	1,119	
DA2	20,607	0.90	769	
DA4	4,442	0.93	172	
DA5	9,396	0.94	368	
DA6	17,772	0.94	698	
DA7	4,539	0.94	178	
DA8	9,521	0.94	372	
DA9	11,690	0.95	462	
TOTAL			4,137	**8,711**

*PROVIDED VIA 30 MC-7200 STORMTECH CHAMBERS w/ 6 END CAPS

CHAMBER DRAIN TIME

ANTICIPATED DRYWELL PERCOLATION RATE PER DRYWELL = 0.1 CFS

$$t = \frac{V}{r}$$

V = VOLUME (CUBIC FEET) = 8,711 CF

r = PERCOLATION RATE = 0.1 CFS

t = TIME TO DRAIN BASIN

STORMTECH RETENTION CHAMBERS

TOTAL RETAINED VOLUME = 8,711 CUBIC FEET

$$t = \frac{8{,}711}{0.1 * 1\ DRYWELLS}$$

t = 87,110 SECONDS

t = 24.2 HOURS

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Oct 3 2025

CROSS SECTION C AND D AT MILLER DRIVEWAY

User-defined

Invert Elev (ft)	= 1248.60
Slope (%)	= 0.40
N-Value	= 0.013

Calculations

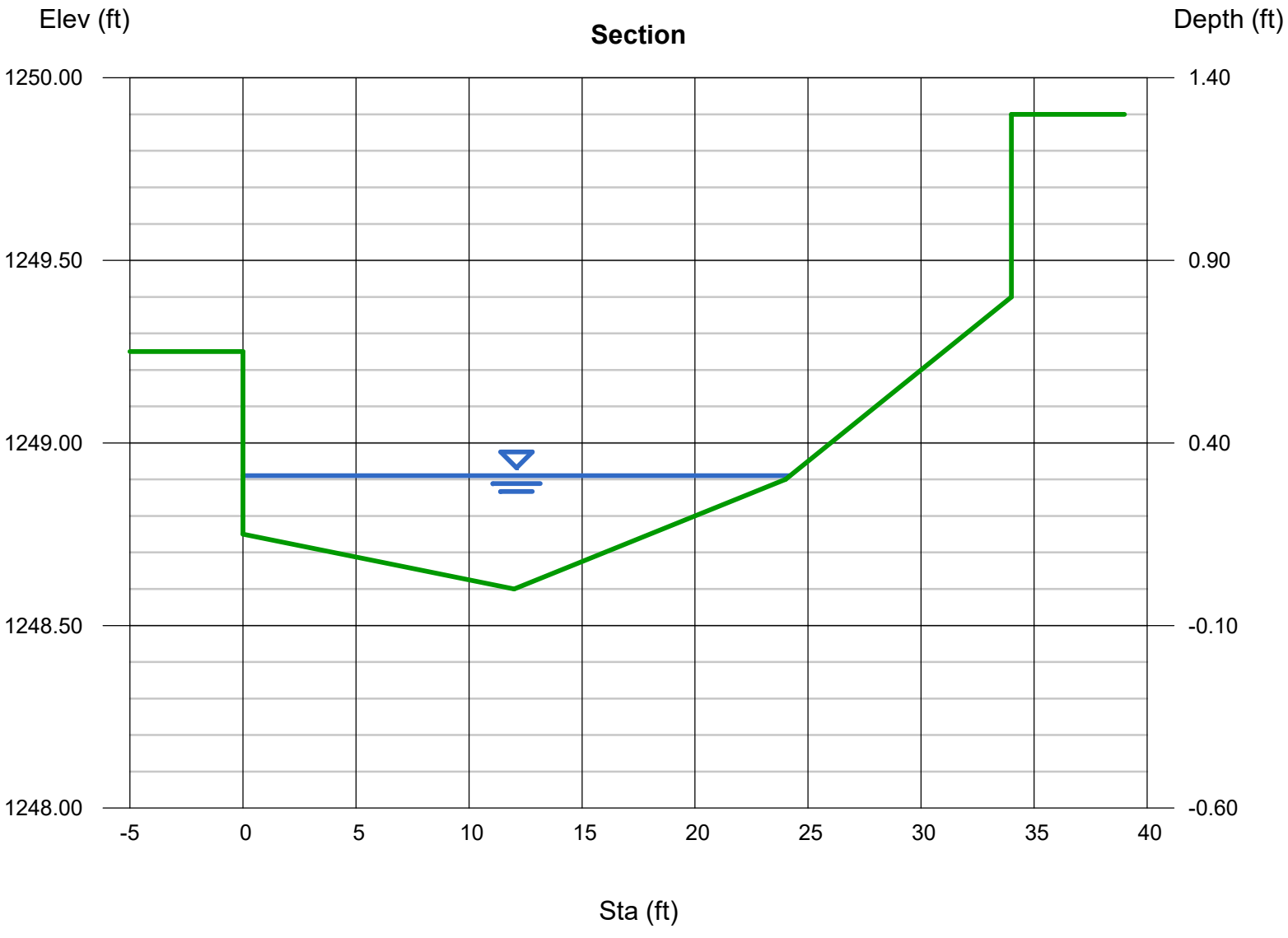
Compute by:	Known Q
Known Q (cfs)	= 11.38

Highlighted

Depth (ft)	= 0.31
Q (cfs)	= 11.38
Area (sqft)	= 4.74
Velocity (ft/s)	= 2.40
Wetted Perim (ft)	= 24.37
Crit Depth, Yc (ft)	= 0.31
Top Width (ft)	= 24.20
EGL (ft)	= 0.40

(Sta, El, n)-(Sta, El, n)...

(0.00, 1249.25)-(12.00, 1248.60, 0.013)-(24.00, 1248.90, 0.013)-(34.00, 1249.40, 0.013)-(34.00, 1249.90, 0.013)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Oct 3 2025

CROSS SECTION A AT NORTH PROPERTY BOUNDARY

User-defined

Invert Elev (ft)	= 1249.55
Slope (%)	= 0.15
N-Value	= 0.018

Calculations

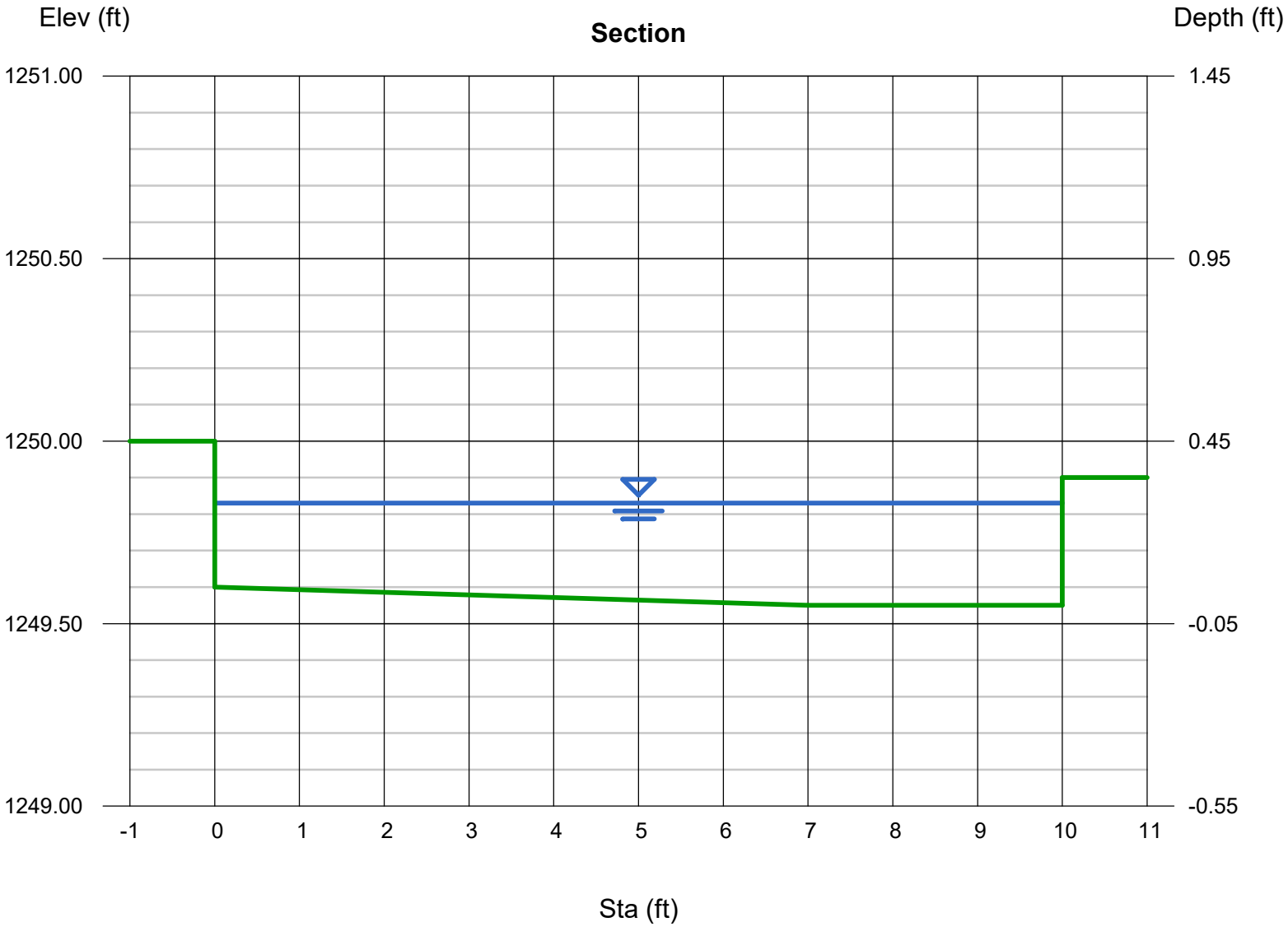
Compute by:	Known Q
Known Q (cfs)	= 3.18

Highlighted

Depth (ft)	= 0.28
Q (cfs)	= 3.180
Area (sqft)	= 2.63
Velocity (ft/s)	= 1.21
Wetted Perim (ft)	= 10.51
Crit Depth, Yc (ft)	= 0.17
Top Width (ft)	= 10.00
EGL (ft)	= 0.30

(Sta, El, n)-(Sta, El, n)...

(0.00, 1250.00)-(7.00, 1249.55, 0.018)-(10.00, 1249.55, 0.018)-(10.00, 1249.90, 0.018)



APPENDIX E
(Discharge Hydrographs)

RICK

SYNTHETIC HYDROGRAPH

PROJECT NAME: SCOTTSDALE UMC MULTIFAMILY
WATERSHED: Existing Site
STORM RETURN PERIOD: 100-YR

Peak Flow =	29.80	cfs
Time of Concentration =	5	minutes
Time to Rise =	13.60	minutes

Time (min)	Time (hr)	t/Tr	Discharge (cfs)	Volume (cf)		Time (min)	Time (hr)	t/Tr	Discharge (cfs)	Volume (cf)
0.00	0.00	0.00	0.00	0.0		49.20	0.82	3.62	1.46	30319.5
1.20	0.02	0.09	0.00	0.0		50.40	0.84	3.71	1.46	30424.6
2.40	0.04	0.18	0.75	53.6		51.60	0.86	3.79	1.46	30529.7
3.60	0.06	0.26	2.59	240.3		52.80	0.88	3.88	0.89	30594.1
4.80	0.08	0.35	4.77	583.6		54.00	0.90	3.97	0.89	30658.5
6.00	0.10	0.44	7.24	1105.0		55.20	0.92	4.06	0.89	30722.8
7.20	0.12	0.53	10.31	1847.4		56.40	0.94	4.15	0.89	30787.2
8.40	0.14	0.62	13.44	2815.0		57.60	0.96	4.24	0.60	30830.1
9.60	0.16	0.71	17.16	4050.9		58.80	0.98	4.32	0.60	30873.0
10.80	0.18	0.79	17.16	5286.8		60.00	1.00	4.41	0.60	30916.0
12.00	0.20	0.88	21.99	6870.2		61.20	1.02	4.50	0.60	30958.9
13.20	0.22	0.97	26.43	8773.4		62.40	1.04	4.59	0.60	31001.8
14.40	0.24	1.06	**29.80**	10919.0		63.60	1.06	4.68	0.36	31027.5
15.60	0.26	1.15	27.54	12901.5		64.80	1.08	4.76	0.36	31053.3
16.80	0.28	1.24	25.00	14701.7		66.00	1.10	4.85	0.36	31079.0
18.00	0.30	1.32	22.53	16323.7		67.20	1.12	4.94	0.36	31104.8
19.20	0.32	1.41	20.20	17778.4		68.40	1.14	5.03	0.24	31121.9
20.40	0.34	1.50	20.20	19233.2		69.60	1.16	5.12	0.24	31139.1
21.60	0.36	1.59	18.00	20529.1		70.80	1.18	5.21	0.24	31156.3
22.80	0.38	1.68	16.24	21698.5		72.00	1.20	5.29	0.24	31173.4
24.00	0.40	1.76	14.36	22732.6		73.20	1.22	5.38	0.24	31190.6
25.20	0.42	1.85	12.64	23642.4		74.40	1.24	5.47	0.24	31207.8
26.40	0.44	1.94	11.09	24440.5		75.60	1.26	5.56	0.24	31224.9
27.60	0.46	2.03	9.63	25133.6		76.80	1.28	5.65	0.24	31242.1
28.80	0.48	2.12	9.63	25826.6		78.00	1.30	5.74	0.24	31259.2
30.00	0.50	2.21	7.18	26343.7		79.20	1.32	5.82	0.24	31276.4
31.20	0.52	2.29	7.18	26860.8		80.40	1.34	5.91	0.24	31293.6
32.40	0.54	2.38	7.18	27377.9		81.60	1.36	6.00	0.24	31310.7
33.60	0.56	2.47	5.33	27761.9		82.80	1.38	6.09	0.24	31327.9
34.80	0.58	2.56	5.33	28146.0		84.00	1.40	6.18	0.24	31345.1
36.00	0.60	2.65	4.05	28437.8		85.20	1.42	6.26	0.24	31362.2
37.20	0.62	2.74	4.05	28729.6		86.40	1.44	6.35	0.24	31379.4
38.40	0.64	2.82	3.04	28948.4		87.60	1.46	6.44	0.24	31396.6
39.60	0.66	2.91	3.04	29167.3		88.80	1.48	6.53	0.24	31413.7
40.80	0.68	3.00	2.32	29334.6		90.00	1.50	6.62	0.24	31430.9
42.00	0.70	3.09	2.32	29502.0		91.20	1.52	6.71	0.24	31448.1
43.20	0.72	3.18	2.32	29669.4		92.40	1.54	6.79	0.24	31465.2
44.40	0.74	3.26	2.32	29836.7		93.60	1.56	6.88	0.24	31482.4
45.60	0.76	3.35	2.32	30004.1		94.80	1.58	6.97	0.24	31499.6
46.80	0.78	3.44	1.46	30109.2		96.00	1.60	7.06	0.00	31499.6
48.00	0.80	3.53	1.46	30214.3		97.20	1.62	7.15	0.00	31499.6

RICK

SYNTHETIC HYDROGRAPH

PROJECT NAME: SCOTTSDALE UMC MULTIFAMILY
WATERSHED: DA3
STORM RETURN PERIOD: 100-YR

Peak Flow =	13.10	cfs
Time of Concentration =	5	minutes
Time to Rise =	13.60	minutes

Time (min)	Time (hr)	t/Tr	Discharge (cfs)	Volume (cf)		Time (min)	Time (hr)	t/Tr	Discharge (cfs)	Volume (cf)
0.00	0.00	0.00	0.00	0.0		49.20	0.82	3.62	0.64	13328.4
1.20	0.02	0.09	0.00	0.0		50.40	0.84	3.71	0.64	13374.6
2.40	0.04	0.18	0.33	23.6		51.60	0.86	3.79	0.64	13420.8
3.60	0.06	0.26	1.14	105.6		52.80	0.88	3.88	0.39	13449.1
4.80	0.08	0.35	2.10	256.6		54.00	0.90	3.97	0.39	13477.4
6.00	0.10	0.44	3.18	485.7		55.20	0.92	4.06	0.39	13505.7
7.20	0.12	0.53	4.53	812.1		56.40	0.94	4.15	0.39	13534.0
8.40	0.14	0.62	5.91	1237.5		57.60	0.96	4.24	0.26	13552.8
9.60	0.16	0.71	7.55	1780.8		58.80	0.98	4.32	0.26	13571.7
10.80	0.18	0.79	7.55	2324.0		60.00	1.00	4.41	0.26	13590.6
12.00	0.20	0.88	9.67	3020.1		61.20	1.02	4.50	0.26	13609.4
13.20	0.22	0.97	11.62	3856.7		62.40	1.04	4.59	0.26	13628.3
14.40	0.24	1.06	13.10	4799.9		63.60	1.06	4.68	0.16	13639.6
15.60	0.26	1.15	12.10	5671.5		64.80	1.08	4.76	0.16	13650.9
16.80	0.28	1.24	10.99	6462.8		66.00	1.10	4.85	0.16	13662.3
18.00	0.30	1.32	9.90	7175.9		67.20	1.12	4.94	0.16	13673.6
19.20	0.32	1.41	8.88	7815.4		68.40	1.14	5.03	0.10	13681.1
20.40	0.34	1.50	8.88	8454.8		69.60	1.16	5.12	0.10	13688.7
21.60	0.36	1.59	7.91	9024.5		70.80	1.18	5.21	0.10	13696.2
22.80	0.38	1.68	7.14	9538.6		72.00	1.20	5.29	0.10	13703.8
24.00	0.40	1.76	6.31	9993.2		73.20	1.22	5.38	0.10	13711.3
25.20	0.42	1.85	5.55	10393.1		74.40	1.24	5.47	0.10	13718.8
26.40	0.44	1.94	4.87	10744.0		75.60	1.26	5.56	0.10	13726.4
27.60	0.46	2.03	4.23	11048.6		76.80	1.28	5.65	0.10	13733.9
28.80	0.48	2.12	4.23	11353.3		78.00	1.30	5.74	0.10	13741.5
30.00	0.50	2.21	3.16	11580.6		79.20	1.32	5.82	0.10	13749.0
31.20	0.52	2.29	3.16	11807.9		80.40	1.34	5.91	0.10	13756.6
32.40	0.54	2.38	3.16	12035.2		81.60	1.36	6.00	0.10	13764.1
33.60	0.56	2.47	2.34	12204.1		82.80	1.38	6.09	0.10	13771.7
34.80	0.58	2.56	2.34	12372.9		84.00	1.40	6.18	0.10	13779.2
36.00	0.60	2.65	1.78	12501.2		85.20	1.42	6.26	0.10	13786.8
37.20	0.62	2.74	1.78	12629.4		86.40	1.44	6.35	0.10	13794.3
38.40	0.64	2.82	1.34	12725.7		87.60	1.46	6.44	0.10	13801.8
39.60	0.66	2.91	1.34	12821.9		88.80	1.48	6.53	0.10	13809.4
40.80	0.68	3.00	1.02	12895.4		90.00	1.50	6.62	0.10	13816.9
42.00	0.70	3.09	1.02	12969.0		91.20	1.52	6.71	0.10	13824.5
43.20	0.72	3.18	1.02	13042.6		92.40	1.54	6.79	0.10	13832.0
44.40	0.74	3.26	1.02	13116.1		93.60	1.56	6.88	0.10	13839.6
45.60	0.76	3.35	1.02	13189.7		94.80	1.58	6.97	0.10	13847.1
46.80	0.78	3.44	0.64	13235.9		96.00	1.60	7.06	0.00	13847.1
48.00	0.80	3.53	0.64	13282.1		97.20	1.62	7.15	0.00	13847.1

RICK

SYNTHETIC HYDROGRAPH

PROJECT NAME: SCOTTSDALE UMC MULTIFAMILY
WATERSHED: DA9
STORM RETURN PERIOD: 100-YR

Peak Flow =	17.40	cfs
Time of Concentration =	5	minutes
Time to Rise =	13.60	minutes

Time (min)	Time (hr)	t/Tr	Discharge (cfs)	Volume (cf)		Time (min)	Time (hr)	t/Tr	Discharge (cfs)	Volume (cf)
0.00	0.00	0.00	0.00	0.0		49.20	0.82	3.62	0.85	17703.3
1.20	0.02	0.09	0.00	0.0		50.40	0.84	3.71	0.85	17764.7
2.40	0.04	0.18	0.44	31.3		51.60	0.86	3.79	0.85	17826.1
3.60	0.06	0.26	1.51	140.3		52.80	0.88	3.88	0.52	17863.7
4.80	0.08	0.35	2.78	340.8		54.00	0.90	3.97	0.52	17901.3
6.00	0.10	0.44	4.23	645.2		55.20	0.92	4.06	0.52	17938.8
7.20	0.12	0.53	6.02	1078.7		56.40	0.94	4.15	0.52	17976.4
8.40	0.14	0.62	7.85	1643.7		57.60	0.96	4.24	0.35	18001.5
9.60	0.16	0.71	10.02	2365.3		58.80	0.98	4.32	0.35	18026.5
10.80	0.18	0.79	10.02	3086.9		60.00	1.00	4.41	0.35	18051.6
12.00	0.20	0.88	12.84	4011.5		61.20	1.02	4.50	0.35	18076.7
13.20	0.22	0.97	15.43	5122.7		62.40	1.04	4.59	0.35	18101.7
14.40	0.24	1.06	17.40	6375.5		63.60	1.06	4.68	0.21	18116.7
15.60	0.26	1.15	16.08	7533.1		64.80	1.08	4.76	0.21	18131.8
16.80	0.28	1.24	14.60	**8584.2**		66.00	1.10	4.85	0.21	18146.8
18.00	0.30	1.32	13.15	9531.3		67.20	1.12	4.94	0.21	18161.8
19.20	0.32	1.41	11.80	10380.7		68.40	1.14	5.03	0.14	18171.9
20.40	0.34	1.50	11.80	11230.1		69.60	1.16	5.12	0.14	18181.9
21.60	0.36	1.59	10.51	11986.8		70.80	1.18	5.21	0.14	18191.9
22.80	0.38	1.68	9.48	12669.6		72.00	1.20	5.29	0.14	18201.9
24.00	0.40	1.76	8.39	13273.4		73.20	1.22	5.38	0.14	18212.0
25.20	0.42	1.85	7.38	13804.6		74.40	1.24	5.47	0.14	18222.0
26.40	0.44	1.94	6.47	14270.6		75.60	1.26	5.56	0.14	18232.0
27.60	0.46	2.03	5.62	14675.3		76.80	1.28	5.65	0.14	18242.0
28.80	0.48	2.12	5.62	15080.0		78.00	1.30	5.74	0.14	18252.0
30.00	0.50	2.21	4.19	15381.9		79.20	1.32	5.82	0.14	18262.1
31.20	0.52	2.29	4.19	15683.8		80.40	1.34	5.91	0.14	18272.1
32.40	0.54	2.38	4.19	15985.7		81.60	1.36	6.00	0.14	18282.1
33.60	0.56	2.47	3.11	16210.0		82.80	1.38	6.09	0.14	18292.1
34.80	0.58	2.56	3.11	16434.2		84.00	1.40	6.18	0.14	18302.2
36.00	0.60	2.65	2.37	16604.6		85.20	1.42	6.26	0.14	18312.2
37.20	0.62	2.74	2.37	16775.0		86.40	1.44	6.35	0.14	18322.2
38.40	0.64	2.82	1.77	16902.8		87.60	1.46	6.44	0.14	18332.2
39.60	0.66	2.91	1.77	17030.6		88.80	1.48	6.53	0.14	18342.2
40.80	0.68	3.00	1.36	17128.3		90.00	1.50	6.62	0.14	18352.3
42.00	0.70	3.09	1.36	17226.0		91.20	1.52	6.71	0.14	18362.3
43.20	0.72	3.18	1.36	17323.7		92.40	1.54	6.79	0.14	18372.3
44.40	0.74	3.26	1.36	17421.4		93.60	1.56	6.88	0.14	18382.3
45.60	0.76	3.35	1.36	17519.2		94.80	1.58	6.97	0.14	18392.4
46.80	0.78	3.44	0.85	17580.5		96.00	1.60	7.06	0.00	18392.4
48.00	0.80	3.53	0.85	17641.9		97.20	1.62	7.15	0.00	18392.4

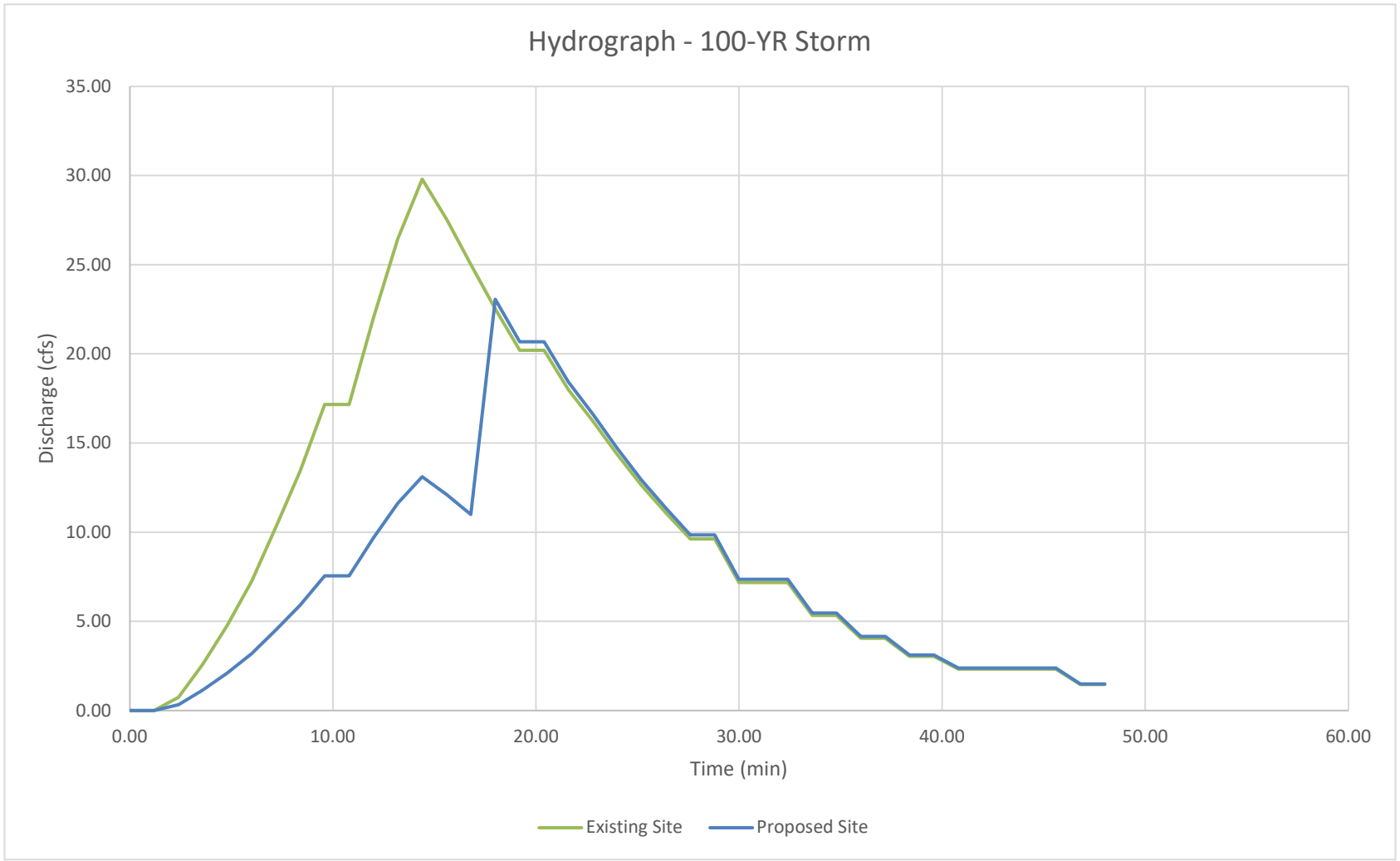
RICK

SYNTHETIC HYDROGRAPH

PROJECT NAME: SCOTTSDALE UMC MULTIFAMILY
WATERSHED: Proposed Site
STORM RETURN PERIOD: 100-YR

Peak Flow =	DA3+DA9	cfs
Time of Concentration =	5	minutes
Time to Rise =	13.60	minutes

Time (min)	Time (hr)	t/Tr	Discharge (cfs)	Volume (cf)		Time (min)	Time (hr)	t/Tr	Discharge (cfs)	Volume (cf)
0.00	0.00	0.00	0.00	0.0		49.20	0.82	3.62	1.49	22447.5
1.20	0.02	0.09	0.00	0.0		50.40	0.84	3.71	1.49	22555.1
2.40	0.04	0.18	0.33	23.6		51.60	0.86	3.79	1.49	22662.7
3.60	0.06	0.26	1.14	105.6		52.80	0.88	3.88	0.92	22728.6
4.80	0.08	0.35	2.10	256.6		54.00	0.90	3.97	0.92	22794.5
6.00	0.10	0.44	3.18	485.7		55.20	0.92	4.06	0.92	22860.3
7.20	0.12	0.53	4.53	812.1		56.40	0.94	4.15	0.92	22926.2
8.40	0.14	0.62	5.91	1237.5		57.60	0.96	4.24	0.61	22970.1
9.60	0.16	0.71	7.55	1780.8		58.80	0.98	4.32	0.61	23014.1
10.80	0.18	0.79	7.55	2324.0		60.00	1.00	4.41	0.61	23058.0
12.00	0.20	0.88	9.67	3020.1		61.20	1.02	4.50	0.61	23101.9
13.20	0.22	0.97	11.62	3856.7		62.40	1.04	4.59	0.61	23145.8
14.40	0.24	1.06	13.10	4799.9		63.60	1.06	4.68	0.37	23172.2
15.60	0.26	1.15	12.10	5671.5		64.80	1.08	4.76	0.37	23198.5
16.80	0.28	1.24	10.99	6462.8		66.00	1.10	4.85	0.37	23224.9
18.00	0.30	1.32	**23.06**	8123.0		67.20	1.12	4.94	0.37	23251.2
19.20	0.32	1.41	20.68	9611.9		68.40	1.14	5.03	0.24	23268.8
20.40	0.34	1.50	20.68	11100.8		69.60	1.16	5.12	0.24	23286.4
21.60	0.36	1.59	18.42	12427.1		70.80	1.18	5.21	0.24	23303.9
22.80	0.38	1.68	16.62	13624.0		72.00	1.20	5.29	0.24	23321.5
24.00	0.40	1.76	14.70	14682.4		73.20	1.22	5.38	0.24	23339.1
25.20	0.42	1.85	12.93	15613.5		74.40	1.24	5.47	0.24	23356.6
26.40	0.44	1.94	11.35	16430.5		75.60	1.26	5.56	0.24	23374.2
27.60	0.46	2.03	9.85	17139.8		76.80	1.28	5.65	0.24	23391.8
28.80	0.48	2.12	9.85	17849.1		78.00	1.30	5.74	0.24	23409.3
30.00	0.50	2.21	7.35	18378.3		79.20	1.32	5.82	0.24	23426.9
31.20	0.52	2.29	7.35	18907.5		80.40	1.34	5.91	0.24	23444.5
32.40	0.54	2.38	7.35	19436.8		81.60	1.36	6.00	0.24	23462.0
33.60	0.56	2.47	5.46	19829.9		82.80	1.38	6.09	0.24	23479.6
34.80	0.58	2.56	5.46	20222.9		84.00	1.40	6.18	0.24	23497.2
36.00	0.60	2.65	4.15	20521.6		85.20	1.42	6.26	0.24	23514.7
37.20	0.62	2.74	4.15	20820.3		86.40	1.44	6.35	0.24	23532.3
38.40	0.64	2.82	3.11	21044.2		87.60	1.46	6.44	0.24	23549.9
39.60	0.66	2.91	3.11	21268.2		88.80	1.48	6.53	0.24	23567.5
40.80	0.68	3.00	2.38	21439.5		90.00	1.50	6.62	0.24	23585.0
42.00	0.70	3.09	2.38	21610.8		91.20	1.52	6.71	0.24	23602.6
43.20	0.72	3.18	2.38	21782.1		92.40	1.54	6.79	0.24	23620.2
44.40	0.74	3.26	2.38	21953.4		93.60	1.56	6.88	0.24	23637.7
45.60	0.76	3.35	2.38	22124.7		94.80	1.58	6.97	0.24	23655.3
46.80	0.78	3.44	1.49	22232.3		96.00	1.60	7.06	0.00	23655.3
48.00	0.80	3.53	1.49	22339.9		97.20	1.62	7.15	0.00	23655.3


Hydrograph - 100-YR Storm
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Discharge (cfs)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
Time (min)
Existing Site
Proposed Site