CIVIL ENGINEERING / SURVEYING / PLANNING / LANDSCAPE ARCHITECTURE

PRELIMINARY DRAINAGE REPORT

Panera, LLC
Bakery Café #: 6263
8970 E Shea Blvd.
Scottsdale, AZ 85260

Date: 01/05/2021
Cole Project #: 21-0067

cole®

Power House at Union Station
401 S. 18th Street
Suite 200
St. Louis, MO 63103
314.984.9887 *tel*

Table of Contents

Section I Introduction

The Panera Bakery Café #6263 is a proposed redevelopment of a commercial site located at 8970 East Shea Blvd, Scottsdale, AZ.

The project is a redevelopment of an existing commercial site, previously a Red Robin Restaurant. The redevelopment of the site will include a complete tear down of the existing 7,612 SF building, construction of a new 3,949 SF Panera Café, and the addition of drive through lanes. There is an existing stormwater storage area in the Southwest corner of the site within an existing drainage easement. This easement will not be intruded upon except where the City of Scottsdale is requiring sidewalk to cross it for pedestrian access. The existing drainage patterns will remain unchanged, and no new storm water infrastructure will be needed.

The purpose of this report is to show that the proposed redevelopment project will have no adverse effects on existing drainage patterns.

Section II Data Analysis Methods

For this project the Rational Method was used to calculate Pre- and Post-Development runoff. The City of Scottsdale Design Standards and Policies Manual requires the evaluation of the 2-, 10-, and, 100-year storm events for calculating Pre- and Post-Development Runoff for site redevelopment. An assumed time of concentration of 5 minutes was used for both the Pre- and Post-Development calculations. The intensity in in/hr was taken from NOAA-14 and Runoff Coefficients (C-factors) were taken from the Scottsdale DSPM. For pervious landscaping on the site, the C-factor for “Desert landscaping (with impervious weed barrier)” was used.

The lowest floor elevation was set to match the existing building lowest floor elevation, assuming the existing building was designed to be higher than adjacent washes.

PRE DEVELOPMENT PEAK DISCHARGE (Q) VALUES 2 YEAR 5 MINUTE DESIGN STORM FREQUENCY							
Designation	TOTAL AREA (sf)	TOTAL AREA (ACRES)	i (2 YR 5 MIN) (in/hr)	IMPERVIOUS AREA	PERVIOUS AREA (DESERT LANDSCAPE)	COMPOSITE C	Q=CiA (in cfs)
A	8,457	0.19	3.76	7,846	611	0.88	0.64
B	34,069	0.78	3.76	31,569	2,500	0.88	2.59
C	29,198	0.67	3.76	8,973	20,225	0.71	1.80
D	18,368	0.42	3.76	16,625	1,743	0.87	1.39
TOTALS	90,092	2.07		65,013	25,079		6.41

PRE DEVELOPMENT PEAK DISCHARGE (Q) VALUES 10 YEAR 5 MINUTE DESIGN STORM FREQUENCY							
Designation	TOTAL AREA (sf)	TOTAL AREA (ACRES)	i (10 YR 5 MIN) (in/hr)	IMPERVIOUS AREA	PERVIOUS AREA (DESERT LANDSCAPE)	COMPOSITE C	Q=CiA (in cfs)
A	8,457	0.19	6.16	7,846	611	0.88	1.05
B	34,069	0.78	6.16	31,569	2,500	0.88	4.24
C	29,198	0.67	6.16	8,973	20,225	0.71	2.94
D	18,368	0.42	6.16	16,625	1,743	0.87	2.27
TOTALS	90,092	2.07		65,013	25,079		10.51

PRE DEVELOPMENT PEAK DISCHARGE (Q) VALUES 100 YEAR 5 MINUTE DESIGN STORM FREQUENCY							
Designation	TOTAL AREA (sf)	TOTAL AREA (ACRES)	i (100 YR 5 MIN) (in/hr)	IMPERVIOUS AREA	PERVIOUS AREA (DESERT LANDSCAPE)	COMPOSITE C	Q=CiA (in cfs)
A	8,457	0.19	10.3	7,846	611	0.94	1.88
B	34,069	0.78	10.3	31,569	2,500	0.94	7.58
C	29,198	0.67	10.3	8,973	20,225	0.87	5.98
D	18,368	0.42	10.3	16,625	1,743	0.94	4.08
TOTALS	90,092	2.07		65,013	25,079		19.53

POST DEVELOPMENT PEAK DISCHARGE (Q) VALUES 2 YEAR 5 MINUTE DESIGN STORM FREQUENCY							
Designation	TOTAL AREA (sf)	TOTAL AREA (ACRES)	i (2 YR 5 MIN) (in/hr)	IMPERVIOUS AREA	PERVIOUS AREA (DESERT LANDSCAPE)	COMPOSITE C	Q=CiA (in cfs)
A	8,457	0.19	3.76	7,846	611	0.88	0.64
B	33,633	0.77	3.76	30,488	3,145	0.87	2.54
C	29,198	0.67	3.76	8,115	21,083	0.71	1.78
D	18,011	0.41	3.76	16,677	1,334	0.88	1.37
TOTALS	89,299	2.05		63,126	26,173		6.33

POST DEVELOPMENT PEAK DISCHARGE (Q) VALUES 10 YEAR MINUTE DESIGN STORM FREQUENCY							
Designation	TOTAL AREA (sf)	TOTAL AREA (ACRES)	i (10 YR 5 MIN) (in/hr)	IMPERVIOUS AREA	PERVIOUS AREA (DESERT LANDSCAPE)	COMPOSITE C	Q=CiA (in cfs)
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B	33,633	0.77	10.3	30,488	3,145	0.94	7.47
C	29,198	0.67	10.3	8,115	21,083	0.86	5.96
D	18,011	0.41	10.3	16,677	1,334	0.94	4.01
TOTALS	89,299	2.05		63,126	26,173		19.32

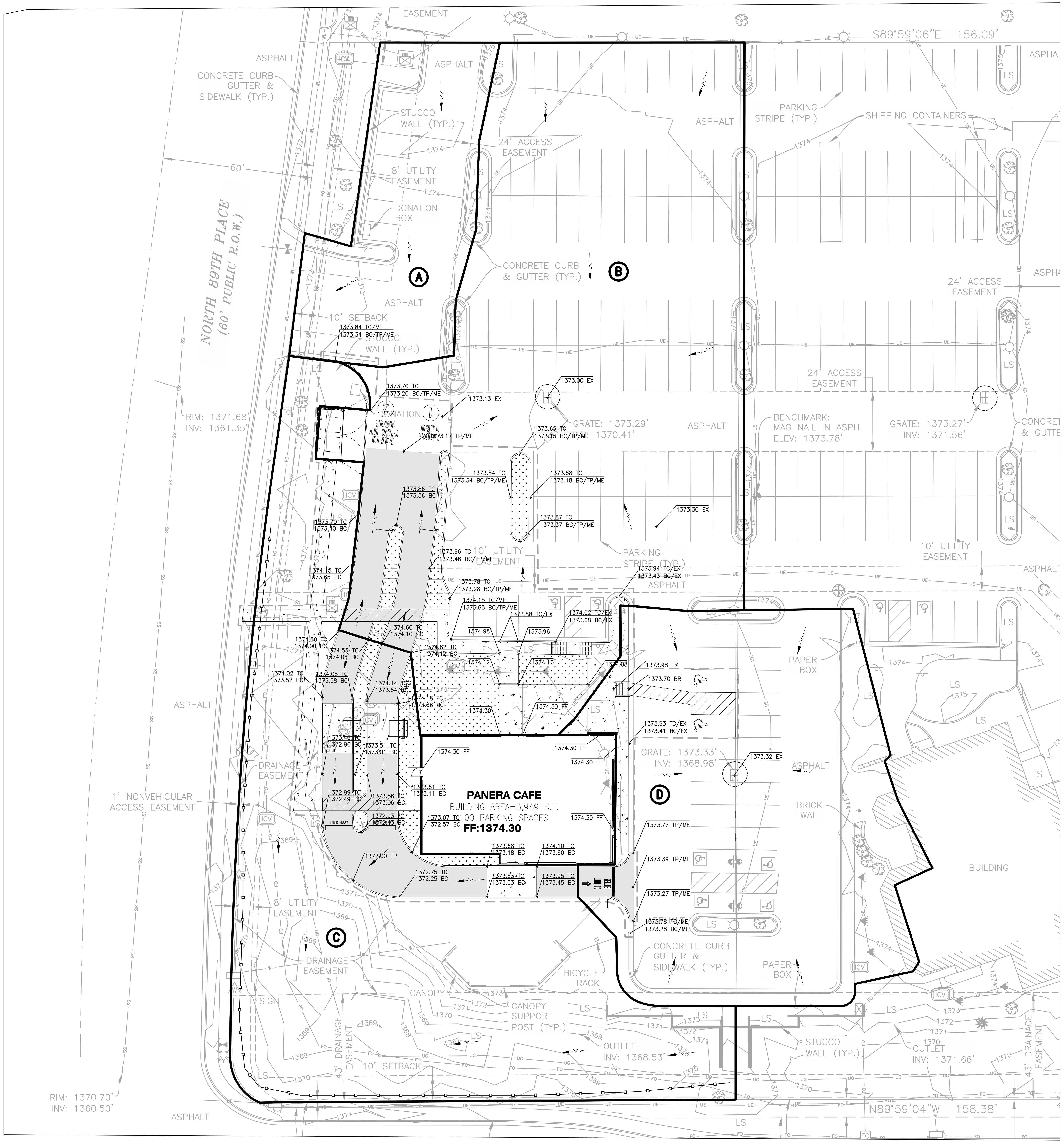
Section III Conclusions

Our calculations using the rational method, existing and proposed site condition, and parameters from the City of Scottsdale and NOAA-14 show that the proposed redevelopment of the site will result in less runoff than the existing conditions, and therefore will not need any changes to the existing stormwater system.

Section IV References and Appendices

Appendix A

Post-Development Drainage Area Map



SCALE: 1" = 20'

GRADING ABBREVIATIONS

BC BOTTOM OF CURB FACE
TC TOP OF CURB FACE
BR BOTTOM OF RAMP
TR TOP OF RAMP
TP TOP OF PAVEMENT
ME MATCH EXISTING
FF FINISHED FLOOR
EX EXISTING TO REMAIN

POST DEVELOPMENT PEAK DISCHARGE (Q) VALUES 2 YEAR 5 MINUTE DESIGN STORM FREQUENCY

Designation	TOTAL AREA (sf)	TOTAL AREA (ACRES)	i (2 YR 5 MIN) (in/hr)	IMPERVIOUS AREA	PERVIOUS AREA (DESERT LANDSCAPE)	COMPOSITE C	Q=CiA (in cfs)
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POST DEVELOPMENT PEAK DISCHARGE (Q) VALUES 10 YEAR MINUTE DESIGN STORM FREQUENCY

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Designation	TOTAL AREA (sf)	TOTAL AREA (ACRES)	i (100 YR 5 MIN) (in/hr)	IMPERVIOUS AREA	PERVIOUS AREA (DESERT LANDSCAPE)	COMPOSITE C	Q=CiA (in cfs)
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D	18,011	0.41	10.3	16,677	1,334	0.94	4.01
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Job Number	21-0067
Sheet Number	

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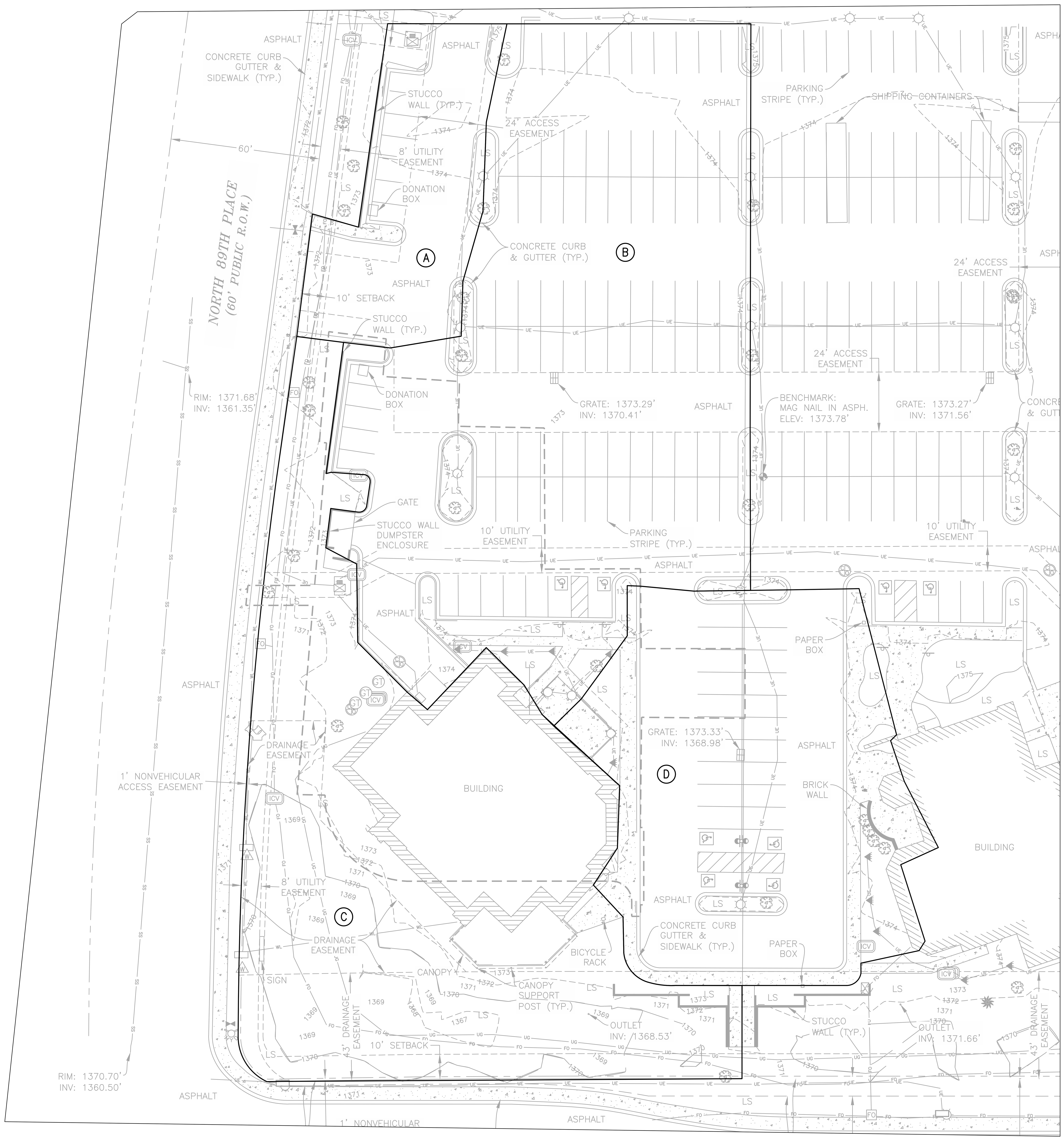
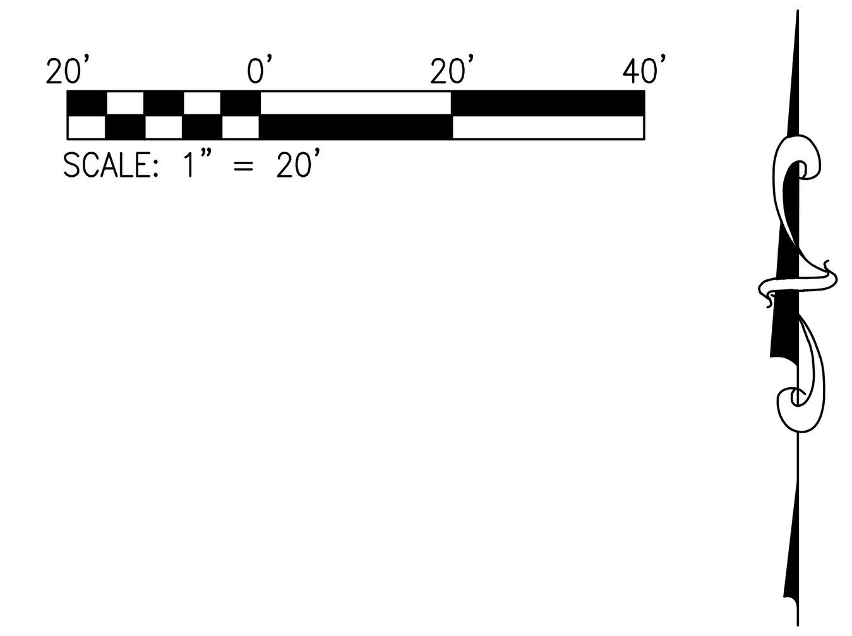
Appendix B

Pre-Development Drainage Area Map





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Appendix C

On-Site Aerial Map

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Sheet Number

Job Number 21-0067

DATE 1/5/2022

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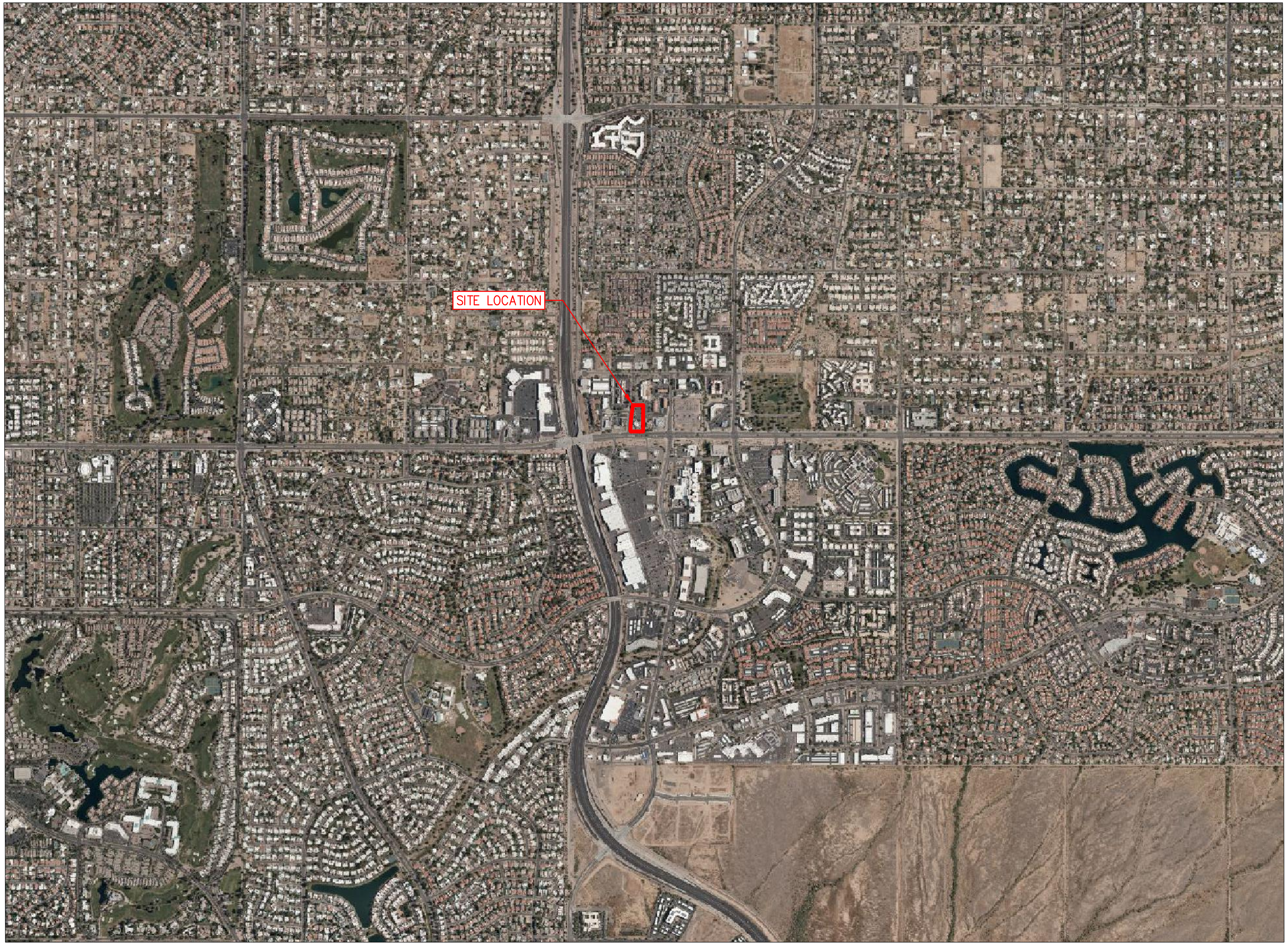
Appendix D

Off-Site Aerial Map



800' 0' 800' 1600'
SCALE: 1" =800'

DATE	NO	REVISION DESCRIPTION

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Appendix E

Calculation Supporting Data

NOAA Atlas 14, Volume 1, Version 5
Location name: Sedona, Arizona, USA*
Latitude: 34.4°, Longitude: -111.7°
Elevation: 4370.37 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	**2.90** (2.47-3.42)	**3.76** (3.19-4.40)	**5.09** (4.30-5.95)	**6.16** (5.18-7.19)	**7.68** (6.41-8.94)	**8.93** (7.37-10.4)	**10.3** (8.38-11.9)	**11.7** (9.43-13.6)	**13.8** (10.9-16.2)	**15.5** (12.1-18.3)
10-min	**2.21** (1.88-2.60)	**2.86** (2.43-3.35)	**3.87** (3.27-4.53)	**4.68** (3.94-5.47)	**5.84** (4.88-6.80)	**6.79** (5.61-7.89)	**7.81** (6.37-9.08)	**8.90** (7.18-10.4)	**10.5** (8.29-12.3)	**11.8** (9.18-13.9)
15-min	**1.83** (1.55-2.15)	**2.36** (2.01-2.77)	**3.20** (2.70-3.74)	**3.87** (3.26-4.52)	**4.83** (4.03-5.62)	**5.61** (4.64-6.52)	**6.45** (5.27-7.50)	**7.36** (5.93-8.58)	**8.66** (6.85-10.2)	**9.75** (7.58-11.5)
30-min	**1.23** (1.05-1.45)	**1.59** (1.35-1.87)	**2.15** (1.82-2.52)	**2.60** (2.19-3.05)	**3.25** (2.71-3.79)	**3.78** (3.12-4.39)	**4.34** (3.55-5.05)	**4.95** (4.00-5.77)	**5.83** (4.61-6.84)	**6.57** (5.11-7.75)
60-min	**0.762** (0.647-0.895)	**0.984** (0.836-1.16)	**1.33** (1.13-1.56)	**1.61** (1.36-1.89)	**2.01** (1.68-2.34)	**2.34** (1.93-2.72)	**2.69** (2.19-3.13)	**3.07** (2.47-3.57)	**3.61** (2.85-4.23)	**4.06** (3.16-4.80)
2-hr	**0.447** (0.388-0.517)	**0.568** (0.492-0.658)	**0.750** (0.650-0.866)	**0.902** (0.776-1.04)	**1.12** (0.954-1.29)	**1.30** (1.10-1.49)	**1.50** (1.24-1.72)	**1.71** (1.40-1.96)	**2.01** (1.62-2.33)	**2.27** (1.79-2.63)
3-hr	**0.325** (0.287-0.373)	**0.411** (0.364-0.471)	**0.531** (0.468-0.607)	**0.631** (0.553-0.718)	**0.775** (0.673-0.881)	**0.893** (0.768-1.01)	**1.02** (0.869-1.16)	**1.16** (0.975-1.33)	**1.37** (1.12-1.57)	**1.54** (1.24-1.78)
6-hr	**0.201** (0.180-0.225)	**0.250** (0.224-0.282)	**0.311** (0.278-0.350)	**0.365** (0.324-0.409)	**0.441** (0.388-0.495)	**0.503** (0.439-0.563)	**0.570** (0.492-0.639)	**0.641** (0.545-0.721)	**0.742** (0.619-0.839)	**0.826** (0.677-0.939)
12-hr	**0.124** (0.111-0.139)	**0.154** (0.138-0.172)	**0.188** (0.168-0.210)	**0.217** (0.194-0.242)	**0.257** (0.228-0.286)	**0.287** (0.253-0.320)	**0.319** (0.279-0.356)	**0.351** (0.304-0.393)	**0.398** (0.339-0.448)	**0.437** (0.368-0.496)
24-hr	**0.076** (0.069-0.084)	**0.095** (0.086-0.105)	**0.119** (0.107-0.131)	**0.138** (0.124-0.152)	**0.164** (0.148-0.180)	**0.185** (0.165-0.202)	**0.206** (0.184-0.226)	**0.228** (0.202-0.250)	**0.258** (0.226-0.283)	**0.281** (0.244-0.310)
2-day	**0.045** (0.040-0.050)	**0.056** (0.051-0.063)	**0.071** (0.063-0.079)	**0.082** (0.073-0.092)	**0.098** (0.087-0.110)	**0.111** (0.098-0.123)	**0.124** (0.109-0.138)	**0.137** (0.120-0.153)	**0.156** (0.135-0.174)	**0.170** (0.147-0.191)
3-day	**0.032** (0.029-0.036)	**0.040** (0.037-0.045)	**0.051** (0.046-0.056)	**0.059** (0.053-0.065)	**0.071** (0.063-0.078)	**0.080** (0.071-0.088)	**0.089** (0.079-0.099)	**0.099** (0.088-0.110)	**0.113** (0.099-0.125)	**0.124** (0.107-0.137)
4-day	**0.026** (0.024-0.029)	**0.032** (0.029-0.036)	**0.041** (0.037-0.045)	**0.047** (0.043-0.052)	**0.057** (0.051-0.062)	**0.064** (0.058-0.070)	**0.072** (0.064-0.079)	**0.080** (0.071-0.088)	**0.091** (0.080-0.101)	**0.100** (0.087-0.111)
7-day	**0.017** (0.016-0.019)	**0.022** (0.020-0.024)	**0.027** (0.024-0.030)	**0.031** (0.028-0.034)	**0.037** (0.034-0.041)	**0.042** (0.038-0.046)	**0.047** (0.042-0.052)	**0.052** (0.046-0.057)	**0.059** (0.052-0.065)	**0.064** (0.056-0.071)
10-day	**0.013** (0.012-0.015)	**0.017** (0.015-0.018)	**0.021** (0.019-0.023)	**0.024** (0.022-0.026)	**0.028** (0.026-0.031)	**0.032** (0.029-0.035)	**0.035** (0.031-0.038)	**0.038** (0.034-0.042)	**0.043** (0.038-0.047)	**0.047** (0.041-0.051)
20-day	**0.009** (0.008-0.009)	**0.011** (0.010-0.012)	**0.013** (0.012-0.014)	**0.015** (0.014-0.016)	**0.017** (0.016-0.019)	**0.019** (0.017-0.021)	**0.021** (0.019-0.022)	**0.022** (0.020-0.024)	**0.024** (0.022-0.026)	**0.026** (0.023-0.028)
30-day	**0.007** (0.006-0.008)	**0.009** (0.008-0.009)	**0.010** (0.010-0.011)	**0.012** (0.011-0.013)	**0.014** (0.012-0.015)	**0.015** (0.014-0.016)	**0.016** (0.015-0.018)	**0.018** (0.016-0.019)	**0.019** (0.017-0.021)	**0.020** (0.018-0.022)
45-day	**0.006** (0.005-0.006)	**0.007** (0.006-0.008)	**0.008** (0.008-0.009)	**0.010** (0.009-0.011)	**0.011** (0.010-0.012)	**0.012** (0.011-0.013)	**0.013** (0.012-0.015)	**0.014** (0.013-0.016)	**0.016** (0.014-0.017)	**0.017** (0.015-0.019)
60-day	**0.005** (0.004-0.005)	**0.006** (0.005-0.006)	**0.007** (0.007-0.008)	**0.008** (0.007-0.009)	**0.009** (0.009-0.010)	**0.010** (0.009-0.011)	**0.011** (0.010-0.012)	**0.012** (0.011-0.013)	**0.013** (0.012-0.014)	**0.014** (0.012-0.015)

[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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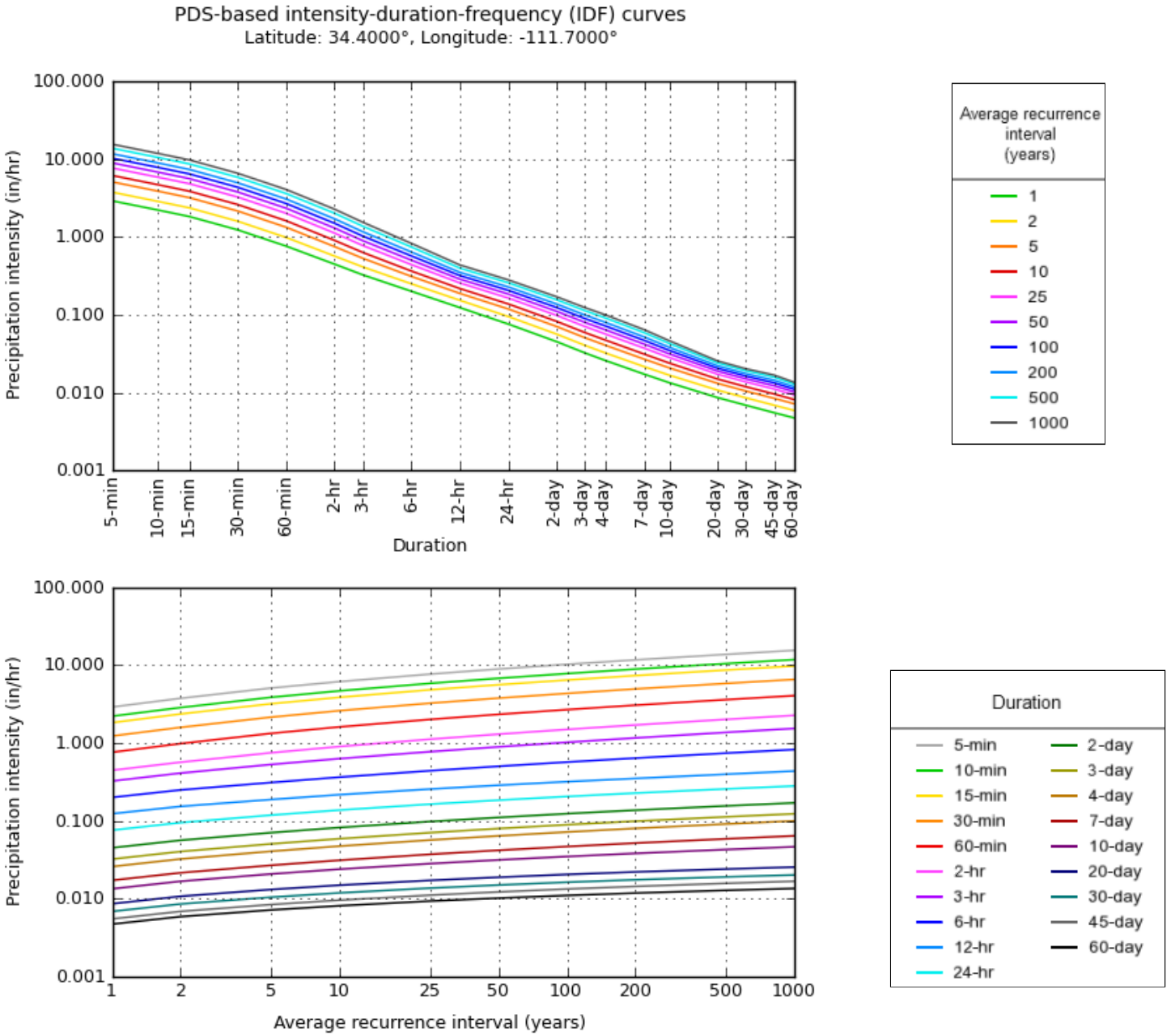
PF graphical



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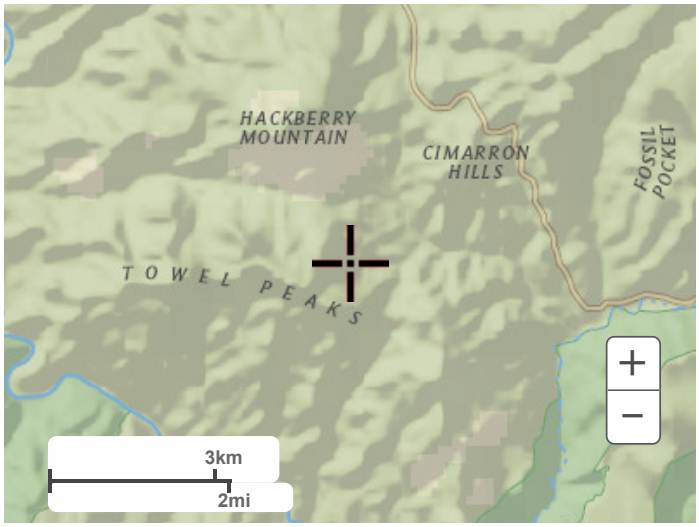
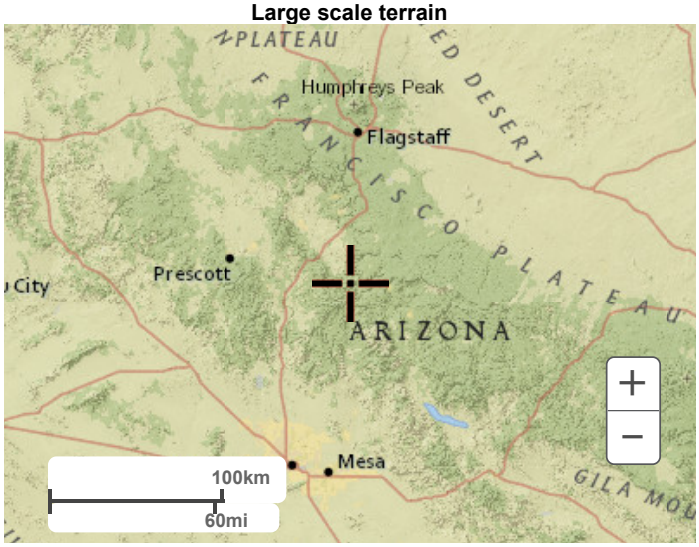
Maps & aerials

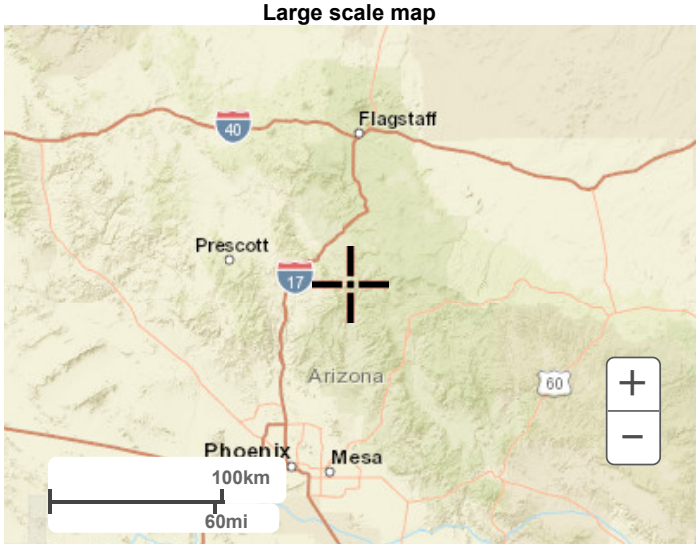
Small scale terrain



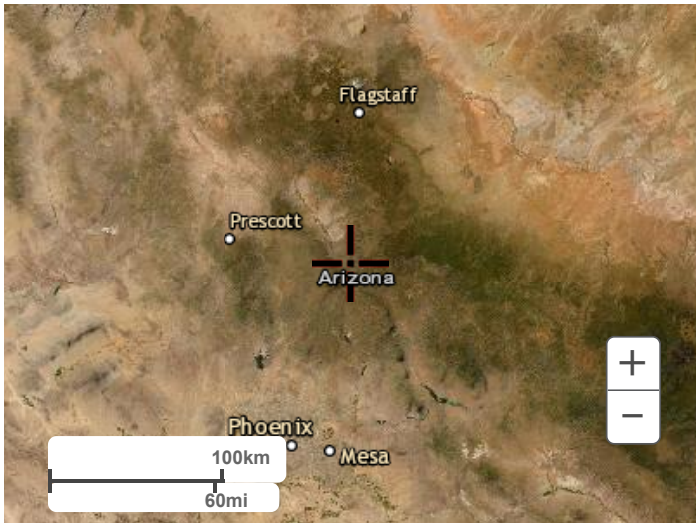
Large scale terrain



Large scale map



Large scale aerial



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Disclaimer

RUNOFF COEFFICIENTS – "C" VALUE

LAND USE	STORM FREQUENCY		
Composite Area-wide Values	2-25 Year	50 Year	100 Year
Commercial & Industrial Areas	0.80	0.83	0.86
Residential Areas – Single Family, slopes 10% or less			
R1-190	0.33	0.50	0.53
R1-130	0.35	0.51	0.59
R1-70	0.37	0.52	0.60
R1-43	0.38	0.55	0.61
R1-35	0.40	0.56	0.62
R1-18	0.43	0.58	0.64
R1-10	0.47	0.62	0.70
R1-7	0.51	0.66	0.80
R1-5	0.54	0.69	0.86
Residential Areas – Single Family, slopes greater than 10%			
R1-190	0.65	0.74	0.82
R1-130	0.68	0.76	0.84
R1-70	0.69	0.77	0.85
R1-43	0.70	0.77	0.85
R1-35	0.70	0.78	0.85
R1-18	0.71	0.79	0.86
R1-10	0.75	0.82	0.88
R1-7	0.81	0.86	0.91
R1-5	0.85	0.89	0.92
Townhouse (R-2, R-4)	0.63	0.74	0.94
Apartments & Condominiums (Condos) (R-3, R-5)	0.76	0.83	0.94
Specified Surface Type Values			
Paved streets, parking lots (concrete or asphalt), roofs, driveways, etc.	0.90	0.93	0.95
Lawns, golf courses, & parks (grassed areas)	0.20	0.25	0.30
Undisturbed natural desert or desert landscaping (no impervious weed barrier)	0.37	0.42	0.45
Desert landscaping (with impervious weed barrier)	0.63	0.73	0.83
Mountain terrain - slopes greater than 10%	0.60	0.70	0.80
Agricultural areas (flood irrigated fields)	0.16	0.18	0.20
Gravel floodways and shoulders	0.68	0.78	0.82

FIGURE 4-1.5 RUNOFF COEFFICIENTS FOR RATIONAL METHOD