KEY ESSENTIALS HANGAR

16060 N. 82nd Street, Scottsdale, AZ 85260

PRELIMINARY DRAINAGE REPORT

JMC JOB NO. 0140
JANUARY 2023
REVISED: MARCH 2023

CASE #: 41-DR-2022

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KEY ESSENTIALS HANGAR

16060 N. 82nd Street
Scottsdale, AZ 85260

PRELIMINARY DRAINAGE REPORT

Prepared For:

DESIGNERS OF PROGRESSIVE ARCHITECTURE
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March 2023

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JMC JOB NUMBER 0140

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Expires: 6-30-2025

1.0 INTRODUCTION

This report is prepared at the direction of DPA Architects, Inc. ("client") as part of the Design Review (DR) submittal process to the City of Scottsdale (COS) for the project, Key Essentials Hangar.

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1.1. SITE LOCATION

The project address is 16060 N. 82nd Street within the City of Scottsdale, Arizona and is further described as being located within a portion of Section 1, Township 3 North (T3N), Range 4 East (R4E) of the Gila and Salt River Baseline and Meridian, Maricopa County, Arizona. The project is bounded to the north and south by existing hangar properties, to the west by a private taxiway, and to the east by N. 82nd Street (**Fig. 1**).

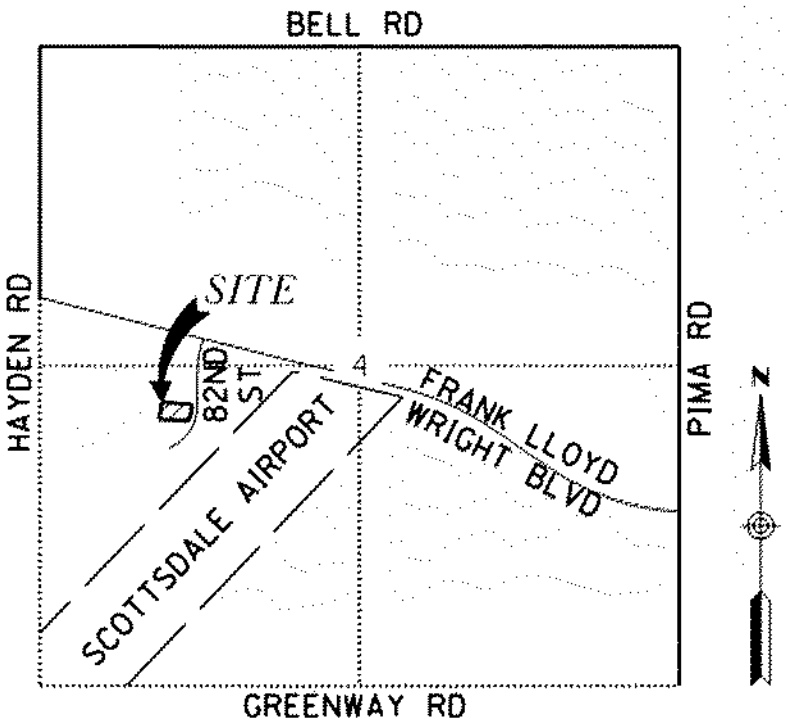


Figure 1: Vicinity Map

1.2. SITE DESCRIPTION

The project consists of one (1) new one (1)-story hangar/office building with mezzanine, concrete parking areas, associated landscape areas, and appurtenant facilities. The proposed hangar shall be designed to house a Cessna citation – CJ4 aircraft, helicopter with helipad, and tug storage on the ground level. The project site encompasses 1.08 gross acres (47,175-sf). The current zoning designation for the project site is (I-1) Scottsdale Municipal Airport with a land use of "Vacant Land" per the Maricopa County Assessor's Parcel Viewer Website. No re-zone is anticipated in support of the project.

1.3. PURPOSE AND OBJECTIVES

The purpose and objectives of this Preliminary Drainage Report are to:

1. Present the existing drainage conditions for the project site and proposed drainage plan for the project site.
2. Provide supporting information required for the proposed grading and drainage concept, in accordance with the City of Scottsdale (COS) and Flood Control District of Maricopa County (FCDMC) drainage requirements.
3. Determine the offsite and onsite peak discharges.
4. Determine the required onsite drainage improvements to convey runoff through the project site.

1.4. RELEVANT DRAINAGE STUDIES

The project is located within the East Shea Corridor Area Drainage Master Study (ADMS), completed for the Flood Control District of Maricopa County (FCDMC) to identify potential flooding hazards in the study area due to the changes in the watershed since 1978. FCDMC has used updated mapping technology and a more technically sound approach to identification of these hazards.

The East Shea Corridor ADMS is an active study, and FCDMC staff is currently building detailed modeling and identifying flood hazards. FLO-2D model results are not available to the public at this time.

2.0 DESCRIPTION OF EXISTING DRAINAGE CONDITIONS

2.1. EXISTING ONSITE CONDITIONS

The project site is currently undeveloped, desert rangeland with minimal brush and vegetation (**Fig. 2**). The site consists of over 85% pervious surfaces and slopes generally from the northeast to the southwest. There are currently no retention or detention facilities provided for the site. Under existing conditions, a portion of the site drains via overland surface flow to an offsite surface retention basin located at the northwest corner of the existing building within the southerly adjacent property. The remainder of the site drains south to the southerly adjacent property. The existing taxiway drains east and contributes runoff to the existing retention basin. A portion of the existing asphalt driveway at the northeast corner of the site drainage east toward 82nd Street.

Table 1 provides a summary of pre-development on-site flows. Refer to Figure 4 in **Appendix A** for the drainage area locations and **Appendix B** for more detailed hydrologic analyses, using the Rational Method.

Table 1: Existing Condition Peak Flow Summary

Concentration Point	Drainage Area	Area	Runoff Coefficient	100-Yr Peak Discharge*	Notes
CP	**DA**	**A**	**C**	**Q_{100}**	
		(ac)		**(cfs)**	
CP-1E	1E	0.72	0.52	2.8	Rational Method
CP-2E	2E	0.36	0.53	2.5	Rational Method

*Design storm is the 100-year event, with a time of concentration of 5-minutes.

2.2. OFFSITE CONDITIONS

Pursuant to the topographic survey prepared for the site, stormwater generated on 82nd Street to the east of the site discharges south and away from the site via existing roadway curb and gutter.

A portion of the Hangar property located north of the site drains east toward 82nd Street. The remainder of the site drains west toward the taxiway, which drains south and away from the project site.

The Hangar property located south of the site is developed and generally flows south and away from the project site.

The property located west of the taxiway drains southwest and away from the site via overland surface flow.

All off-site flows shall continue to drain to historical locations in the same path, direction, and magnitude.

2.3. FEMA FLOOD HAZARD ZONE

Table 2: Flood Insurance Rate Map Information

COMMUNITY NUMBER	PANEL #	PANEL DATE	SUFFIX	DATE OF FIRM (INDEX DATE)	FIRM ZONE	BASE FLOOD ELEVATION (FT) (BASE FLOOD DEPTH IN ZONE AO)
045012	1320	10/16/13	L	07/20/21	ZONE X (SHADED)	N/A

The proposed site lies within Flood Hazard Zone "X" shaded as indicated on map number 04013C2215L, dated October 16, 2013, of the FEMA Flood Insurance Rate Map (Fig. 3).

Zone "X" (shaded) areas are defined by Federal Emergency Management Agency (FEMA) as areas of 0.2% annual chance of flood; areas of 1% annual chance of flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

3.0 PROPOSED DRAINAGE PLAN

3.1. GENERAL DESCRIPTION

As discussed in Section 1.2, the proposed project includes construction of the hangar/office along with the associated parking, drainage, and landscape areas. The existing access drives on 82nd Street shall remain unchanged. Half of the existing drive aisles located at the northeast corner and southeast corner of the site shall be improved from asphalt to concrete pavement.

Overall, the area of imperviousness will increase due to project improvements. The proposed drainage design includes grated catch basin inlets, concrete valley gutters, trench drains, curb opening inlets, and storm drain to capture storm water from pavement areas and convey stormwater to two (2) C.M.P. underground storage tanks. Refer to **Appendix F** for the Grading & Drainage Plan.

Table 3 provides a summary of post-development on-site flows. Refer to Figure 5 in **Appendix A** for the drainage area locations and **Appendix B** for more detailed hydrologic analyses.

Table 3: Proposed Condition Peak Flow Summary

Concentration Point	Drainage Area	Area	Runoff Coefficient	100-Yr Peak Discharge*	Notes
CP	DA	A	C	Q_{100}	
		(ac)		(cfs)	
CP-1P	1P	0.43	0.95	3.1	To Underground Tank (UST-01)
CP-2P.1	2P.1	0.10	0.88	0.7	To Underground Tank (UST-02)
CP-2P.2	2P.2	0.11	0.83	0.7	To Underground Tank (UST-02)
CP-2P.3	2P.3	0.18	0.77	1.1	To Underground Tank (UST-02)
CP-2P.4	2P.4	0.01	0.95	0.1	To Underground Tank (UST-02)
CP-2P.5	2P.5	0.25	0.95	1.8	To Underground Tank (UST-02)

*Design storm is the 100-year event, with a time of concentration of 5-minutes.

3.2. STORMWATER STORAGE REQUIREMENTS

Pursuant to the City of Scottsdale (COS) *Design Standards & Policies Manual* (DS&PM) 2018, Section 4-1.201.C.1.a, Page 185, "For sites that have not been previously developed, or portions of a site thereof, the 100-year, 2-hour storm event shall be retained on-site."

Pursuant to the COS DS&PM 2018, Section 4-1.201.C.2.b, "Retention of the first flush volume is encouraged, if the stormwater storage facility will be fully evacuated within 36 hours based on the requirements contained within Section 4.1-201(B)(2)."

The development does not include street improvements at the perimeter of the property, thus retention of the 82nd Street half-street Is not required. Table 4, below, provides the proposed retention summary for the project. Refer to **Appendix D** for a more detailed retention analysis.

Table 4: Retention Summary

Major Basin	Volume Required	Volume Provided	Volume Excess	Notes*
(ID)	(V_r)	(V_p)	(V_e)	
	(ft^3)	(ft^3)	(ft^3)	
1P	3,358	3,534	176	To Underground Tank (UST-01)
2P	4,667	5,105	438	To Underground Tank (UST-02)
TOTAL:	8,025	8,639	614	Vol. Prov. Exceeds Vol. Req. for the Site

The calculated First Flush Volume for Drainage Area 1P is 740-cf.
The calculated First Flush Volume for Drainage Area 2P is 1,029-cf.

The calculated First Flush Volumes for both drainage areas are less than the 100-year, 2-hour volumes thus the underground tank systems, sized for the 100-year, 2-hour storm, accommodate the First Flush Volumes.

3.2.1. STORMWATER DISPOSAL

The use of drywells is required such that storm water dissipates within 36 hours at a minimum disposal rate of 0.1-cfs per second. The number of drywells required for the project is summarized in Table 5. Refer to **Appendix D** for these calculations and **Appendix F** for the

Preliminary Grading & Drainage Plan prepared JMC Engineering for the Key Essentials Hangar.

Table 5: Disposal summary

Retention Basin (ID)	Volume Retained (V_R) (ft^3)	Design Disposal rate (R_I) (ft^3/s)	(ft^3/hr)	Number of Drywells (N)
UST-01	3,534	0.10	360.00	1
UST-02	5,105	0.10	360.00	1

The project meets City of Scottsdale and FCDMC retention and disposal standards.

Pursuant to Section 3.2 of this report, the calculated First Flush Volumes for both drainage areas are less than the 100-year, 2-hour volumes thus the drywells, quantified for the 100-year, 2-hour storm, are adequate to treat the First Flush Volumes as they are percolated.

3.2.2. EMERGENCY OUTFALL

Per Section 2.1 of this report, the west portion of existing site drains southwesterly to an existing retention basin located on the southerly adjacent property. The remaining east portion of existing site drains southerly toward the driveway located on the southerly adjacent property.

This project proposes to retain the entire 100-year, 2-hour storm event on-site. For storm events exceeding the 100-year, 2-hour, the emergency outfall locations are as follows:

- Drainage Area 1P emergency outfalls over proposed retaining wall to the existing retention basin within property to the south, as it does in the pre-development condition.
- Drainage Area 2P emergency outfalls to the driveway within property to the south, as it does in the pre-development condition.

All emergency outfalls are consistent with pre-development flow patterns.

3.2.3. UNDERGROUND STORAGE TANK REQUIREMENTS

All proposed underground storage tanks shall meet the City's USST policy in Section 4-1.202 of the City's Design Standards & Policies Manual (DSPM), which includes but is not limited to the following:

a. The owner must dedicate a public drainage easement over the USST, with no major vegetation such as trees within the easement. At a minimum, the easement should extend at a projected slope of 1:1 from the bottom of the pipe.
b. The USST must have at least a 75-year life, including the lining and coating.
c. The USST must drain by gravity.
d. Specify MAG supplemental standard detail 2554 for corrugated metal pipes.
e. A minimum of two access points must be provided for each USST.
f. An Operations and Maintenance (O&M) Manual must be prepared for the system prior to approval of final plans.
g. Final plans must include signs at each end of the USST.
h. A signed and notarized Ownership and Responsibility Statement must be provided prior to approval of final plans.
i. Add the required warning signs

3.3. PROPOSED DRAINAGE STRUCTURES

Several drainage structures will be required in order to convey the onsite flows through the project site to proposed retention basins. These structures consist of grated catch basins, trench drains, curb opening inlets, and storm drains. **Figure 5** depicts the local drainage structures together with the associated local contributing watersheds.

Hydraulic calculations and sizing of all drainage infrastructure for the 100-year event shall be provided as part of the final engineering phase and Final Drainage Report.

3.3.1. LOWEST FLOOR ELEVATION

In order to ensure that the lowest finish floor elevation(s) are free from inundation during the 100-year storm frequency event, the finished floor elevation of 1,511.00-ft (NAVD '88 Datum) was selected such that it is above the high curb within the adjacent roadway, 14-inches above low curb (or the site outfall, whichever is greater).

- The lowest floor elevation for the new Key Essentials Hanger is set at 1,511.00-ft which is 0.16-ft or 1.92-inches above the high curb on 82nd Street at the northeast corner of the property (1,510.84-ft)
- The lowest floor elevation for the new Key Essentials Hanger is set at 1,511.00-ft which is 2.23-ft or 26.76-inches above the low curb on 82nd Street at the southeast corner of the property (1,508.77-ft)
- The lowest floor elevation for the new Key Essentials Hanger is set at 1,511.00-ft which is 3.67-ft or 44.04-inches above the site outfall at the southwest corner of the property (1,507.33-ft)

3.4. PROJECT PHASING

The project is proposed to be constructed as one phase. All proposed drainage infrastructure will be constructed as one phase.

4.0 SPECIAL CONDITIONS

There are no special conditions anticipated for this project.

5.0 DATA ANALYSIS METHODS

5.1. HYDROLOGIC PROCEDURES

The drainage scheme for this project was determined in accordance with the existing topographic and drainage features. The hydrologic analyses were done using the following methodologies and procedures:

1. Proposed drainage improvements were designed consistent with *The City of Scottsdale Design Standards and Policies Manual* (2018) and the *Drainage Design Manual for Maricopa County*, Volumes I and II (DDM Vol. I and Vol. II).
2. Pre-development and post-development flows for the 100-year event were determined using the Rational Method through the Drainage Design Management System (DDMSW) software, version

5.3.0, available from the Flood Control District of Maricopa County. In accordance with *The City of Scottsdale Design Standards and Policies Manual* (COS DSPM, 2018) the Rational Method was utilized because all watersheds are less than 160 acres. Default runoff coefficients from the COS DSPM were utilized based on land use and cover type.

3. Rainfall intensity for Rational Method calculations was determined from NOAA Atlas 14 for the site location by the DDMSW software.

4. Precipitation values for retention calculations were determined from NOAA Atlas 14 for the site location. Refer to **Appendix F** for an excerpt of the NOAA Atlas 14.

5. Figure 4.1-5 of the *City of Scottsdale Design Standards and Policies Manual* was utilized to determine runoff coefficients for the Rational Method. Per the referenced figure, desert landscaped areas and pavement/rooftop areas corresponded to a runoff coefficient of 0.45 and 0.95 for the 100-year storm event, respectively.

5.2. HYDRAULIC PROCEDURES

Hydraulic calculations and sizing of all drainage infrastructure for the 100-year event shall be provided as part of the final engineering phase and Final Drainage Report.

1. Inlets are sized using the weir equation (weir coefficient (C) = 3.0), assuming a clogging factor of 0.5 for grated inlets and trench drains, 0.25 for curb opening inlets, and with the constraint that the maximum allowable depth of ponded water within a parking lot is 0.5-ft.
2. Storm drain analysis is performed using the Bentley's StormCAD Connect Edition 10.03. Tailwater elevations are set at the top elevation of proposed underground tanks.

5.3. STORMWATER STORAGE CALCULATIONS

1. Required stormwater storage volumes (retention) are calculated in accordance with Section 4-1.807 of *The City of Scottsdale Design Standards and Policies Manual* (2018).
2. The retention required for the site is the 100-year, 2-hour storm volume and the First Flush Volume, whichever is greater. The calculated First Flush Volumes are less than the calculated 100-year, 2-hour volumes thus retention provided as sized for the 100-year, 2-hour storm also accommodates the First Flush Volume.
3. Disposal of the 100-year, 2-hour storm volume (and the first flush volume) shall occur within 36-hours with a design disposal rate of 0.1-cfs via a dual chamber drywell system.

6.0 STORMWATER QUALITY

Pursuant to the COS DP&SM 2018, Section 4-1.401.B, "Stormwater runoff from construction sites can include pollutants such as phosphorous, nitrogen, pesticides, petroleum derivatives, construction chemicals, solid wastes and sediment that adversely affect water quality. Compliance with the Construction General Permit will help prevent these pollutants from entering washes, lakes, other surface waters and the city's SD system." As such, project sites with disturbance areas that exceed 1-acre are required to submit a Notice of Intent (NOI) application and a Storm Water Pollution Prevention Plan (SWPPP) to the Arizona Department of Environmental Quality (ADEQ).

The operators must keep a copy of the SWPPP on site. In addition to ADEQ enforcement, the City may enforce stormwater management requirements, through inspections, responding to complaints and other means.

After ADEQ approval, the operator must include 2 copies of the approved NOI and SWPPP with improvement plan submittal to the City.

Once construction is completed, as defined in the Construction General Permit, the operators must send a Notice of Termination (NOT) to ADEQ and the City.

Project disturbance area is 1.08-acres which warrants the SWPPP and NOI application to ADEQ. This is a Preliminary Drainage Report. The required NOI application, certification, and SWPPP shall be provided as part of the Final Engineering phase and within the Final Drainage Report (COS DP&SM 2018, Appendix 4-1A.E.2, Page 213).

7.0 CONCLUSIONS

- This is a *Preliminary* Drainage Report.
- The proposed project is designed in conformance with FCDMC Hydrology and Hydraulics *Drainage Design Manuals* 2018.
- Two (2) underground storage tanks are proposed to retain the 100-year, 2-hour onsite runoff for the site.
- The First Flush Volume required for all drainage areas are less than the calculated 100-year, 2-hour volumes for the site, thus the two (2) underground storage tanks are sufficiently sized to accommodate the First Flush Volume in addition to the 100-year, 2-hour onsite runoff for the site.
- Proposed conveyance infrastructure shall be designed to convey the onsite 100-year storm event.
- Peak Discharges have been calculated using the Rational Method.
- At a minimum, finished floors will be designed to be 14-inches above the lowest adjacent top of curb elevation or the lowest drainage outfall and designed to be above the highest adjacent top of curb elevation or the adjacent roadway crown, perpendicular to the property.
- The project disturbance area (1.08-acres) exceeds 1 -acre and is subject to a NOI application and SWPPP review through ADEQ and the City of Scottsdale. A SWPPP and NOI certificate shall be provided as part of Final Engineering within the Final Drainage Report.
- On-going maintenance is required to ensure the proposed drainage system performs as designed. Maintenance of private storm drain systems is the responsibility of private parties.

8.0 ENGINEER'S STATEMENT

The drainage design concept presented in this Preliminary Drainage Report assures that drainage affecting the project will be handled in a manner that does not conflict with any federal, state, and/or county regulations intended to protect adjacent properties and/or the project itself from adverse impacts during design storm events specified in the current regulations.

Disclaimer – ***Any deviations from the drainage scheme and hydraulic design presented herein, or any variations in climatic or watershed conditions may affect the functionality and other hydrologic or hydraulic characteristics of this project and nullify the results presented herein.***

9.0 REFERENCES

- Flood Control District of Maricopa County, Drainage Design Manual for Maricopa County, Arizona, Volume I – Hydrology. December 14, 2018.
- Flood Control District of Maricopa County, Drainage Design Manual for Maricopa County, Arizona, Volume II – Hydraulics. December 14, 2018.
- City of Scottsdale, Design Standards and Policies Manual. 2018.
- City of Scottsdale, Stormwater & Floodplain Management Ordinance, 2016 Update.

APPENDIX A: Figures & Exhibits

1. *Figure 2 – Aerial Exhibit*
2. *Figure 3 – FEMA Firmette*
3. *Figure 4 – Existing Conditions Drainage Exhibit*
4. *Figure 5 – Post-Development Drainage Exhibit*

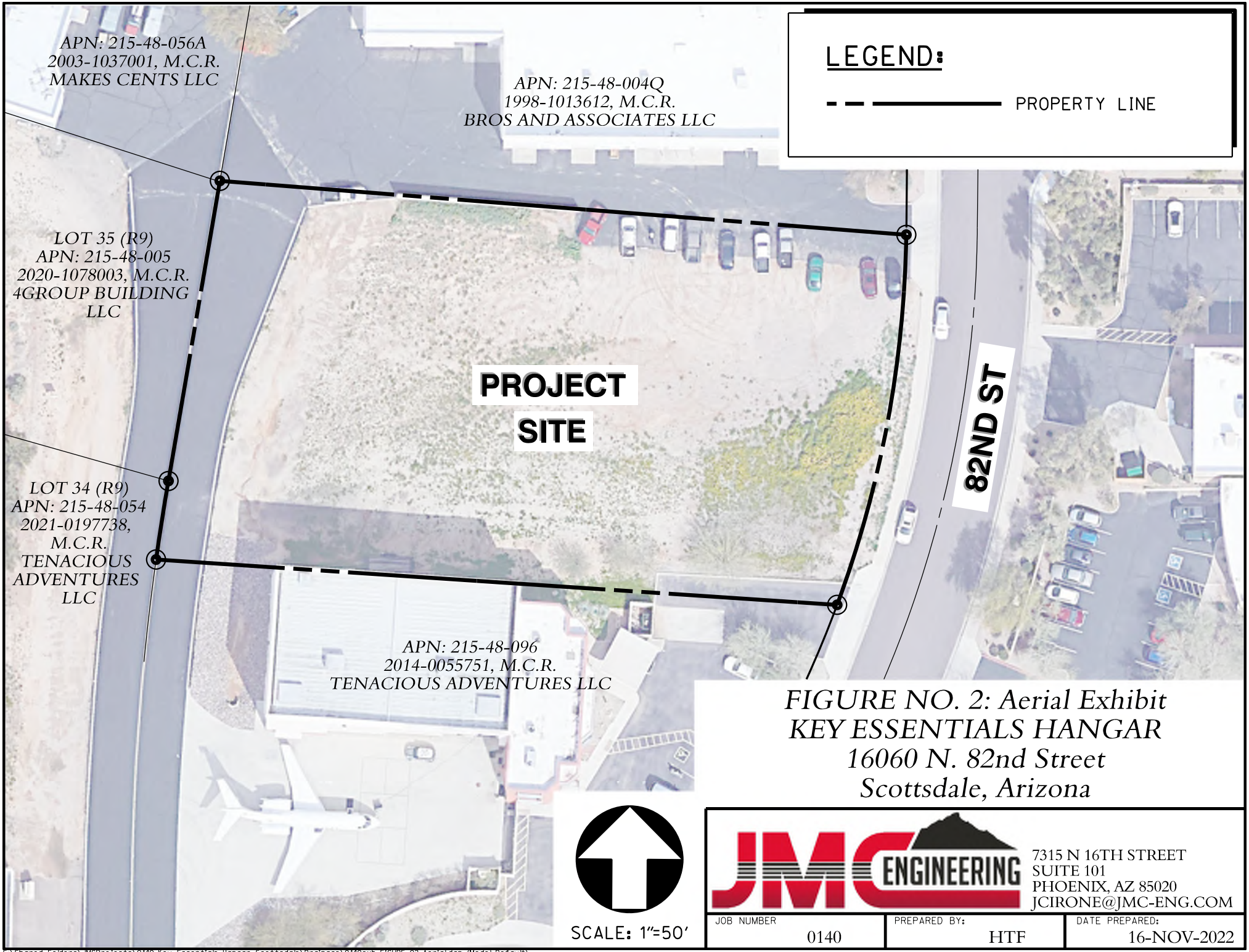


FIGURE NO. 2: Aerial Exhibit
KEY ESSENTIALS HANGAR
16060 N. 82nd Street
Scottsdale, Arizona

SCALE: 1"=50'

JMC ENGINEERING
7315 N 16TH STREET
SUITE 101
PHOENIX, AZ 85020
JCIRONE@JMC-ENG.COM

JOB NUMBER	PREPARED BY:	DATE PREPARED:
0140	HTF	16-NOV-2022

S:\Shared Folders\JMCProjects\0140-Key Essentials Hangar Scottsdale\Drainage\0140exB_FIGURE 02_Aerial.dgn (Model: Default)
16-NOV-2022

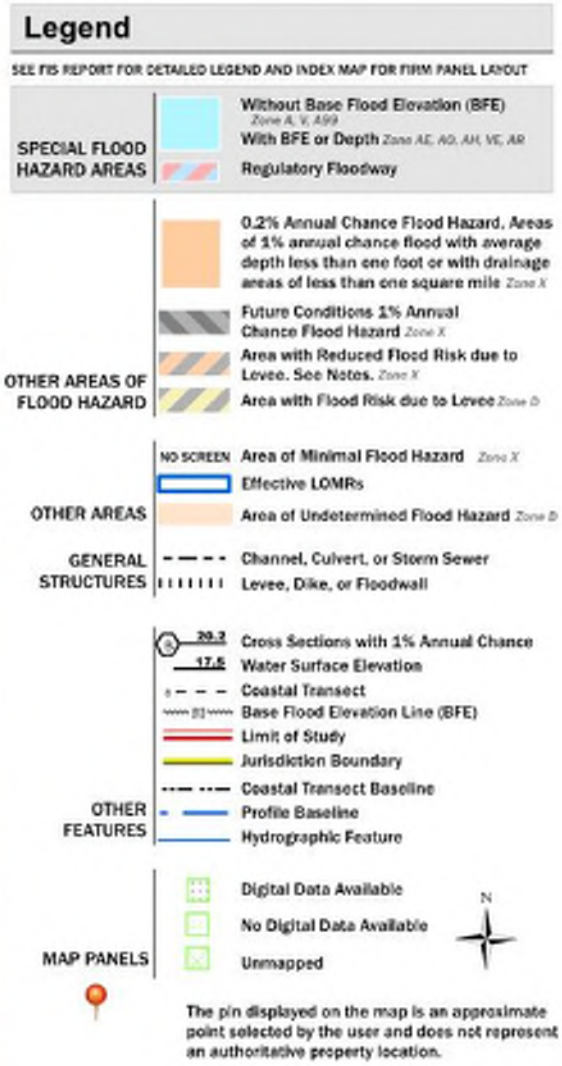


FIG. 3: FEMA FIRMETTE
KEY ESSENTIALS HANGAR
16060 N. 82nd Street
Scottsdale, Arizona

FEMA

SCALE: 1"=500'

JMC ENGINEERING
7315 N 16TH STREET
SUITE 101
PHOENIX, AZ 85020
JCIRONE@JMC-ENG.COM

JOB NUMBER	PREPARED BY:	DATE PREPARED:
0140	HTF	16-NOV-2022

LEGEND

- SITE OUTFALL LOCATION
- INDICATES EXISTING DRAINAGE AREA DELINEATION
- INDICATES EXISTING DRAINAGE AREA
- PROJECT BOUNDARY
- FLOW LINE
- EXISTING CONTOURS
- FLOW DIRECTION

EXISTING CONDITION 100-YEAR PEAK DISCHARGES				
CP	DRAINAGE AREA	AREA	C COEFFICIENT	PEAK DISCHARGE
(ID)	(DA)	(A)	(C)	Q_{100}*
		(AC)		(CFS)
1E	1E	0.72	0.52	2.8
2E	2E	0.36	0.53	1.5

*Time of Concentration is 5 minutes.
No on-site retention is provided in pre-development condition.

APN: 215-48-056A
2003-1037001, M.C.R.
MAKES CENTS LLC

APN: 215-48-004Q
1998-1013612, M.C.R.
BROS AND ASSOCIATES LLC

LOT 35 (R9)
APN: 215-48-005
2020-1078003, M.C.R.
4GROUP BUILDING LLC

LOT 34 (R9)
APN: 215-48-054
2021-0197738, M.C.R.
TENACIOUS ADVENTURES LLC

APN: 215-48-096
2014-0055751, M.C.R.
TENACIOUS ADVENTURES LLC

UNDEVELOPED
1E

UNDEVELOPED
2E

S85°30'27"E 290.96'

N09°43'23"E 128.64'

S86°11'31"W 288.44'

R=1,000.00'
Δ=00°56'53"
L=34.00'

R=470.00', Δ=18°14'53", L=149.83'
R=500.00', Δ=18°14'53", L=159.24'
R=500.00', Δ=43°32'15", L=379.94'

82ND STREET

30' R/W

R=500.00', Δ=24°41'15", L=215.44'

SCALE 1" =20'

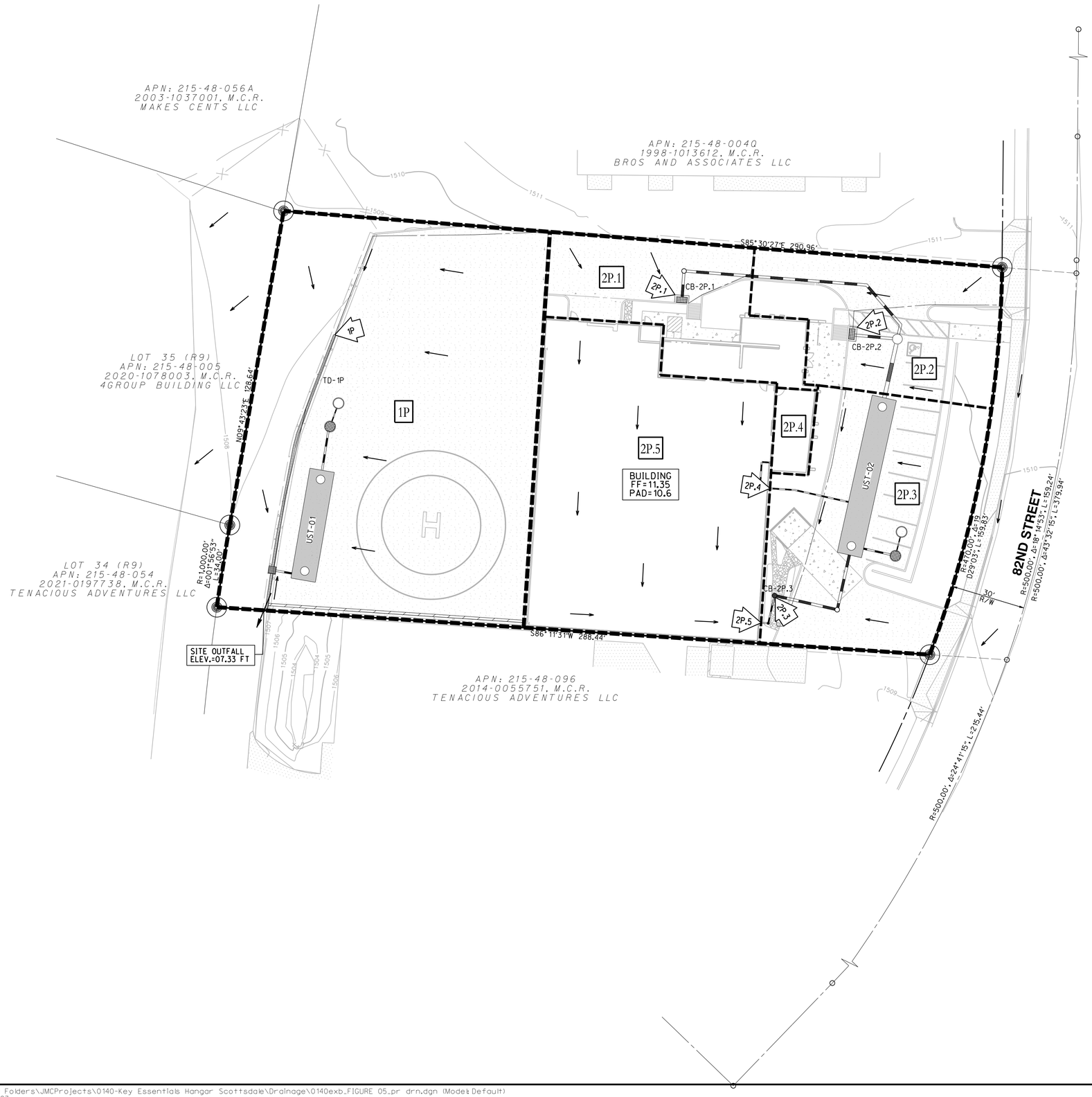
0 20 40 60

FIGURE NO. 4:
Existing Drainage Exhibit
KEY ESSENTIALS HANGAR
16060 N. 82nd Street
Scottsdale, Arizona

Contact Arizona 811 at least two full working days before you begin excavation
Call 811 or click Arizona811.com

JMC ENGINEERING
7315 N 16TH STREET
SUITE 101
PHOENIX, AZ 85020
JCIRONE@JMC-ENG.COM

DATE: 26-JAN-2023 | PROJECT NO. 0140 | PM: HTF



LEGEND

- INDICATES DRAINAGE AREA DELINEATION
- PROPERTY BOUNDARY
- INDICATES FLOWLINE
- 1P — INDICATES DRAINAGE AREA
- FLOW DIRECTION
- INDICATES PROPOSED DRYWELL
- PROPOSED STORM DRAIN
- CB-XX.X — PROPOSED CATCH BASIN INLET
- TD-XX.X — PROPOSED TRENCH DRAIN
- PROPOSED UNDERGROUND TANK

PROPOSED CONDITION RETENTION SUMMARY

MAJOR BASIN (ID)	VOLUME REQUIRED (VR) (cf)	VOLUME PROVIDED (VP) (cf)	VOLUME EXCESS (VE) (cf)	NOTES
1P	3,358	3,534	176	Conveyed to Underground Tank UST-01
2P	4,667	5,105	438	Conveyed to Underground Tank UST-02

VOLUME PROVIDED>VOLUME REQUIRED

PROPOSED 100-YEAR PEAK DISCHARGES

CP (ID)	DRAINAGE AREA (DA)	AREA (A) (AC)	C COEFFICIENT (C)	PEAK DISCHARGE Q_{100}* (CFS)
1P	1P	0.43	0.95	3.1
2P.1	2P.1	0.10	0.88	0.7
2P.2	2P.2	0.11	0.83	0.7
2P.3	2P.3	0.18	0.77	1.1
2P.4	2P.4	0.01	0.95	0.1
2P.5	2P.5	0.25	0.95	1.8

*Time of Concentration is 5 minutes.

N

SCALE 1" =20'

0 20 40 60

FIGURE NO. 5:
Proposed Drainage Exhibit
KEY ESSENTIALS HANGAR
16060 N. 82nd Street
Scottsdale, Arizona

Contact Arizona 811 at least two full working days before you begin excavation
Call 811 or click Arizona811.com

7315 N 16TH STREET
SUITE 101
PHOENIX, AZ 85020
JCIRONE@JMC-ENG.COM

DATE: 9-MAR-2023 | PROJECT NO. 0140 | PM: HTF

APPENDIX B: Hydrologic Analysis

1. DDMSW Software (FCDMC) Output Results

RUNOFF COEFFICIENT

Drainage Design Manual for Maricopa County, Volume II - Hydraulics . August 15, 2013.
Section 4.6, "Design Example," Equation 2.3.2.

$$C_W = \frac{A_1C_1 + A_2C_2 + \cdots + A_{n+1}C_{n+1}}{A_1 + A_2 + \cdots + A_{n+1}}$$

C_w Weighted Runoff Coefficient
A_i Area of Subbasin, square feet
C_i Runoff Coefficient for Subbasin, (as determined by:
City of Scottsdale *Design Standards & Policies Manual 2018,* Figure 4-1.5*)*

DRAINAGE AREA (ID)	***LAND USE***	***RUNOFF COEFFICIENT*** (C) (100-YR)	***SUBBASIN AREA*** (A) (ft^2)	(CA) (ft^2)	***WEIGHTED RUNOFF COEFFICIENT*** (C_W)
1E	Desert Landscaping	0.45	27,025	12,161	0.45
	Paved streets, Rooftops	0.95	4,258	4,045	0.95
1E			31,283	16,206	**0.52**
2E	Desert Landscaping	0.45	13,304	5,987	0.45
	Paved streets, Rooftops	0.95	2,454	2,332	0.95
2E			15,758	8,318	**0.53**
1P	Desert Landscaping	0.45	5	2	0.45
	Paved streets, Rooftops	0.95	18,680	17,746	0.95
1P			18,685	17,748	**0.95**
2P.1	Desert Landscaping	0.45	601	270	0.45
	Paved streets, Rooftops	0.95	3,566	3,388	0.95
2P.1			4,167	3,658	**0.88**
2P.2	Desert Landscaping	0.45	1,210	545	0.45
	Paved streets, Rooftops	0.95	3,669	3,486	0.95
2P.2			4,879	4,030	**0.83**
2P.3	Desert Landscaping	0.45	2,800	1,260	0.45
	Paved streets, Rooftops	0.95	4,919	4,673	0.95
2P.3			7,719	5,933	**0.77**
2P.4	Desert Landscaping	0.45	0	0	0.00
	Paved streets, Rooftops	0.95	544	517	0.95
2P.4			544	517	**0.95**
2P.5	Desert Landscaping	0.45	0	0	0.00
	Paved streets, Rooftops	0.95	11,047	10,495	0.95
2P.5			11,047	10,495	**0.95**

Project

Reference	0140
Title	Key Essentials Hangar
Location	City of Scottsdale
Agency	Flood Control District of Maricopa County

Project Defaults

Model	Rational
Land Use Agency	FCDMC
Rainfall	NOAA14
Roads Agency	MCDOT
Inlets Agency	MAG

Comments

Duration	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr	200 Yr	500 Yr	1000 Yr
DEFAULT									
5 Min	0.252	0.339	0.407	0.498	0.567	0.639	0.710	0.807	0.881
10 Min	0.383	0.516	0.619	0.757	0.863	0.973	1.080	1.228	1.340
15 Min	0.475	0.640	0.767	0.939	1.070	1.206	1.339	1.523	1.661
30 Min	0.640	0.862	1.033	1.265	1.441	1.624	1.803	2.051	2.237
1 Hour	0.792	1.067	1.279	1.565	1.783	2.010	2.232	2.538	2.769
2 Hour	0.918	1.220	1.452	1.770	2.009	2.256	2.504	2.840	3.100
3 Hour	1.009	1.316	1.561	1.903	2.177	2.459	2.757	3.163	3.488
6 Hour	1.198	1.529	1.794	2.152	2.431	2.723	3.022	3.424	3.741
12 Hour	1.341	1.692	1.966	2.337	2.621	2.916	3.213	3.609	3.917
24 Hour	1.577	2.032	2.394	2.902	3.303	3.722	4.156	4.759	5.238

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: 0140

Sub Basin	Land Use Code	Area (acres)	Area (%)	Kb	Runoff Coefficient C						Description
					2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	
Major Basin ID: 01											
1E	900	0.72	100.0	0.041	0.41*	0.41*	0.41*	0.46*	0.50*	0.52*	Vacant (Existing land use database only)
		0.720	**100.0**								
1P	620	0.43	100.0	0.042	0.76*	0.76*	0.76*	0.84*	0.91*	0.95*	Airports (Includes public use airports)
		0.430	**100.0**								
2E	900	0.36	100.0	0.043	0.42*	0.42*	0.42*	0.46*	0.51*	0.53*	Vacant (Existing land use database only)
		0.360	**100.0**								
2P.1	620	0.10	100.0	0.046	0.70*	0.70*	0.70*	0.77*	0.84*	0.88*	Airports (Includes public use airports)
		0.100	**100.0**								
2P.2	620	0.11	100.0	0.046	0.66*	0.66*	0.66*	0.73*	0.79*	0.83*	Airports (Includes public use airports)
		0.110	**100.0**								
2P.3	620	0.18	100.0	0.045	0.61*	0.61*	0.61*	0.68*	0.74*	0.77*	Airports (Includes public use airports)
		0.180	**100.0**								
2P.4	620	0.01	100.0	0.053	0.76*	0.76*	0.76*	0.84*	0.91*	0.95*	Airports (Includes public use airports)
		0.010	**100.0**								
2P.5	620	0.25	100.0	0.044	0.76*	0.76*	0.76*	0.84*	0.91*	0.95*	Airports (Includes public use airports)
		0.250	**100.0**								

* Non default value

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
1E	0.7	299	1,511.30	1,504.50	120.1	0.041	Q (cfs)	0.9	1.2	1.5	2.0	2.4	2.8
							C	0.41	0.41	0.41	0.46	0.50	0.52
							CA (ac)	0.30	0.30	0.30	0.33	0.36	0.37
							Volume (ac-ft)	0.0230	0.0305	0.0363	0.0487	0.0603	0.0696
							Tc (min)	5	5	5	5	5	5
							i (in/hr)	3.02	4.07	4.88	5.98	6.80	7.67
2E	0.4	232	1,511.30	1,507.00	97.9	0.043	Q (cfs)	0.5	0.6	0.7	1.0	1.2	1.5
							C	0.42	0.42	0.42	0.46	0.51	0.53
							CA (ac)	0.15	0.15	0.15	0.17	0.18	0.19
							Volume (ac-ft)	0.0115	0.0153	0.0182	0.0251	0.0301	0.0357
							Tc (min)	5	5	5	5	5	5
							i (in/hr)	3.02	4.07	4.88	5.98	6.80	7.67
1P	0.4	114	1,510.50	1,507.80	125.1	0.042	Q (cfs)	1.0	1.3	1.6	2.2	2.7	3.1
							C	0.76	0.76	0.76	0.84	0.91	0.95
							CA (ac)	0.33	0.33	0.33	0.36	0.39	0.41
							Volume (ac-ft)	0.0252	0.0336	0.0399	0.0531	0.0653	0.0771
							Tc (min)	5	5	5	5	5	5
							i (in/hr)	3.02	4.07	4.88	5.98	6.80	7.67
2P.1	0.1	38	1,511.00	1,510.30	97.3	0.046	Q (cfs)	0.2	0.3	0.3	0.5	0.5	0.7
							C	0.70	0.70	0.70	0.77	0.84	0.88
							CA (ac)	0.07	0.07	0.07	0.08	0.08	0.09
							Volume (ac-ft)	0.0054	0.0071	0.0085	0.0118	0.0134	0.0169
							Tc (min)	5	5	5	5	5	5
							i (in/hr)	3.02	4.07	4.88	5.98	6.80	7.67
2P.2	0.1	81	1,511.30	1,510.30	65.2	0.046	Q (cfs)	0.2	0.3	0.3	0.5	0.6	0.7
							C	0.66	0.66	0.66	0.73	0.79	0.83

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
							CA (ac)	0.07	0.07	0.07	0.08	0.09	0.09
							Volume (ac-ft)	0.0054	0.0071	0.0085	0.0118	0.0151	0.0169
							Tc (min)	5	5	5	5	5	5
							i (in/hr)	3.02	4.07	4.88	5.98	6.80	7.67
2P.3	0.2	124	1,511.00	1,506.10	208.6	0.045	Q (cfs)	0.3	0.4	0.5	0.7	0.9	1.1
							C	0.61	0.61	0.61	0.68	0.74	0.77
							CA (ac)	0.11	0.11	0.11	0.12	0.13	0.14
							Volume (ac-ft)	0.0084	0.0112	0.0133	0.0177	0.0218	0.0263
							Tc (min)	5	5	5	5	5	5
							i (in/hr)	3.02	4.07	4.88	5.98	6.80	7.67
2P.4	-	33	1.70	1.00	112.0	0.053	Q (cfs)	-	-	-	0.1	0.1	0.1
							C	0.76	0.76	0.76	0.84	0.91	0.95
							CA (ac)	0.01	0.01	0.01	0.01	0.01	0.01
							Volume (ac-ft)	0.0008	0.0010	0.0012	0.0015	0.0017	0.0019
							Tc (min)	5	5	5	5	5	5
							i (in/hr)	3.02	4.07	4.88	5.98	6.80	7.67
2P.5	0.3	124	3.60	1.00	110.7	0.044	Q (cfs)	0.6	0.8	0.9	1.3	1.6	1.8
							C	0.76	0.76	0.76	0.84	0.91	0.95
							CA (ac)	0.19	0.19	0.19	0.21	0.23	0.24
							Volume (ac-ft)	0.0145	0.0193	0.0230	0.0310	0.0385	0.0451
							Tc (min)	5	5	5	5	5	5
							i (in/hr)	3.02	4.07	4.88	5.98	6.80	7.67

APPENDIX C: Hydraulic Calculations

1. *Inlet Sizing Calculations*
2. *StormCAD Software Output Results*

Hydraulic calculations and sizing of all drainage infrastructure for the 100-year event shall be provided as part of the final engineering phase and Final Drainage Report.

APPENDIX D: Retention Analysis

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.6319°, Longitude: -111.9042°
Elevation: 1505.81 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)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.194** (0.161-0.237)	**0.253** (0.212-0.310)	**0.341** (0.283-0.416)	**0.409** (0.338-0.498)	**0.501** (0.406-0.607)	**0.570** (0.458-0.686)	**0.643** (0.506-0.772)	**0.714** (0.554-0.856)	**0.812** (0.613-0.974)	**0.886** (0.656-1.06)
10-min	**0.295** (0.245-0.361)	**0.385** (0.322-0.472)	**0.520** (0.430-0.634)	**0.623** (0.514-0.758)	**0.762** (0.619-0.924)	**0.869** (0.697-1.04)	**0.979** (0.771-1.18)	**1.09** (0.843-1.30)	**1.24** (0.933-1.48)	**1.35** (0.998-1.62)
15-min	**0.366** (0.304-0.448)	**0.478** (0.399-0.585)	**0.645** (0.534-0.786)	**0.772** (0.637-0.940)	**0.945** (0.767-1.15)	**1.08** (0.864-1.30)	**1.21** (0.956-1.46)	**1.35** (1.04-1.62)	**1.53** (1.16-1.84)	**1.67** (1.24-2.01)
30-min	**0.493** (0.409-0.603)	**0.643** (0.538-0.788)	**0.868** (0.719-1.06)	**1.04** (0.858-1.27)	**1.27** (1.03-1.54)	**1.45** (1.16-1.74)	**1.63** (1.29-1.96)	**1.82** (1.41-2.17)	**2.06** (1.56-2.48)	**2.25** (1.67-2.70)
60-min	**0.610** (0.506-0.746)	**0.796** (0.666-0.975)	**1.07** (0.890-1.31)	**1.29** (1.06-1.57)	**1.58** (1.28-1.91)	**1.80** (1.44-2.16)	**2.02** (1.59-2.43)	**2.25** (1.74-2.69)	**2.55** (1.93-3.06)	**2.79** (2.06-3.35)
2-hr	**0.713** (0.600-0.853)	**0.923** (0.780-1.11)	**1.23** (1.03-1.46)	**1.46** (1.21-1.74)	**1.78** (1.47-2.11)	**2.02** (1.64-2.39)	**2.27** (1.81-2.67)	**2.52** (1.98-2.96)	**2.86** (2.19-3.36)	**3.12** (2.34-3.68)
3-hr	**0.791** (0.667-0.968)	**1.01** (0.857-1.25)	**1.32** (1.11-1.62)	**1.57** (1.30-1.91)	**1.91** (1.57-2.31)	**2.19** (1.77-2.62)	**2.47** (1.96-2.96)	**2.77** (2.16-3.31)	**3.18** (2.40-3.80)	**3.50** (2.59-4.19)
6-hr	**0.953** (0.819-1.13)	**1.20** (1.03-1.43)	**1.53** (1.31-1.81)	**1.80** (1.52-2.12)	**2.16** (1.80-2.53)	**2.44** (2.00-2.85)	**2.73** (2.21-3.18)	**3.03** (2.41-3.54)	**3.44** (2.66-4.01)	**3.75** (2.84-4.38)
12-hr	**1.07** (0.923-1.26)	**1.35** (1.16-1.59)	**1.70** (1.46-2.00)	**1.98** (1.69-2.32)	**2.35** (1.98-2.75)	**2.64** (2.20-3.07)	**2.94** (2.41-3.41)	**3.24** (2.62-3.76)	**3.63** (2.87-4.24)	**3.94** (3.06-4.63)
24-hr	**1.25** (1.10-1.45)	**1.59** (1.40-1.84)	**2.05** (1.79-2.37)	**2.42** (2.10-2.79)	**2.93** (2.53-3.38)	**3.34** (2.85-3.84)	**3.76** (3.19-4.33)	**4.20** (3.52-4.83)	**4.81** (3.96-5.55)	**5.30** (4.30-6.14)
2-day	**1.35** (1.18-1.56)	**1.72** (1.50-1.99)	**2.25** (1.96-2.60)	**2.68** (2.31-3.08)	**3.27** (2.80-3.76)	**3.73** (3.17-4.29)	**4.22** (3.56-4.87)	**4.74** (3.95-5.48)	**5.45** (4.47-6.32)	**6.02** (4.86-7.01)
3-day	**1.45** (1.27-1.67)	**1.86** (1.63-2.13)	**2.45** (2.14-2.80)	**2.92** (2.54-3.34)	**3.59** (3.10-4.10)	**4.12** (3.54-4.71)	**4.70** (4.00-5.38)	**5.30** (4.47-6.09)	**6.15** (5.10-7.08)	**6.84** (5.60-7.91)
4-day	**1.56** (1.37-1.78)	**1.99** (1.76-2.27)	**2.64** (2.32-3.00)	**3.16** (2.77-3.60)	**3.91** (3.41-4.45)	**4.52** (3.91-5.14)	**5.17** (4.44-5.89)	**5.87** (4.98-6.71)	**6.85** (5.74-7.85)	**7.66** (6.33-8.82)
7-day	**1.76** (1.54-2.02)	**2.25** (1.97-2.58)	**2.98** (2.61-3.41)	**3.58** (3.13-4.09)	**4.43** (3.84-5.06)	**5.13** (4.41-5.85)	**5.87** (5.01-6.71)	**6.66** (5.63-7.65)	**7.79** (6.49-8.97)	**8.71** (7.16-10.1)
10-day	**1.91** (1.68-2.18)	**2.44** (2.15-2.79)	**3.24** (2.84-3.69)	**3.88** (3.39-4.41)	**4.79** (4.16-5.44)	**5.52** (4.76-6.27)	**6.30** (5.39-7.18)	**7.13** (6.05-8.14)	**8.31** (6.94-9.51)	**9.26** (7.64-10.7)
20-day	**2.36** (2.09-2.69)	**3.05** (2.69-3.46)	**4.03** (3.55-4.57)	**4.78** (4.19-5.42)	**5.80** (5.06-6.57)	**6.58** (5.73-7.47)	**7.39** (6.39-8.41)	**8.23** (7.06-9.39)	**9.35** (7.95-10.7)	**10.2** (8.61-11.8)
30-day	**2.78** (2.44-3.16)	**3.58** (3.15-4.06)	**4.72** (4.16-5.35)	**5.60** (4.92-6.34)	**6.79** (5.92-7.68)	**7.70** (6.70-8.72)	**8.65** (7.48-9.79)	**9.61** (8.25-10.9)	**10.9** (9.29-12.4)	**11.9** (10.1-13.6)
45-day	**3.24** (2.87-3.67)	**4.18** (3.70-4.73)	**5.52** (4.88-6.23)	**6.52** (5.75-7.37)	**7.85** (6.89-8.87)	**8.86** (7.74-10.0)	**9.90** (8.59-11.2)	**10.9** (9.44-12.4)	**12.3** (10.5-14.1)	**13.4** (11.4-15.4)
60-day	**3.60** (3.19-4.06)	**4.65** (4.13-5.25)	**6.13** (5.43-6.91)	**7.21** (6.38-8.13)	**8.64** (7.61-9.74)	**9.70** (8.50-10.9)	**10.8** (9.39-12.2)	**11.8** (10.3-13.4)	**13.3** (11.4-15.1)	**14.3** (12.2-16.4)

[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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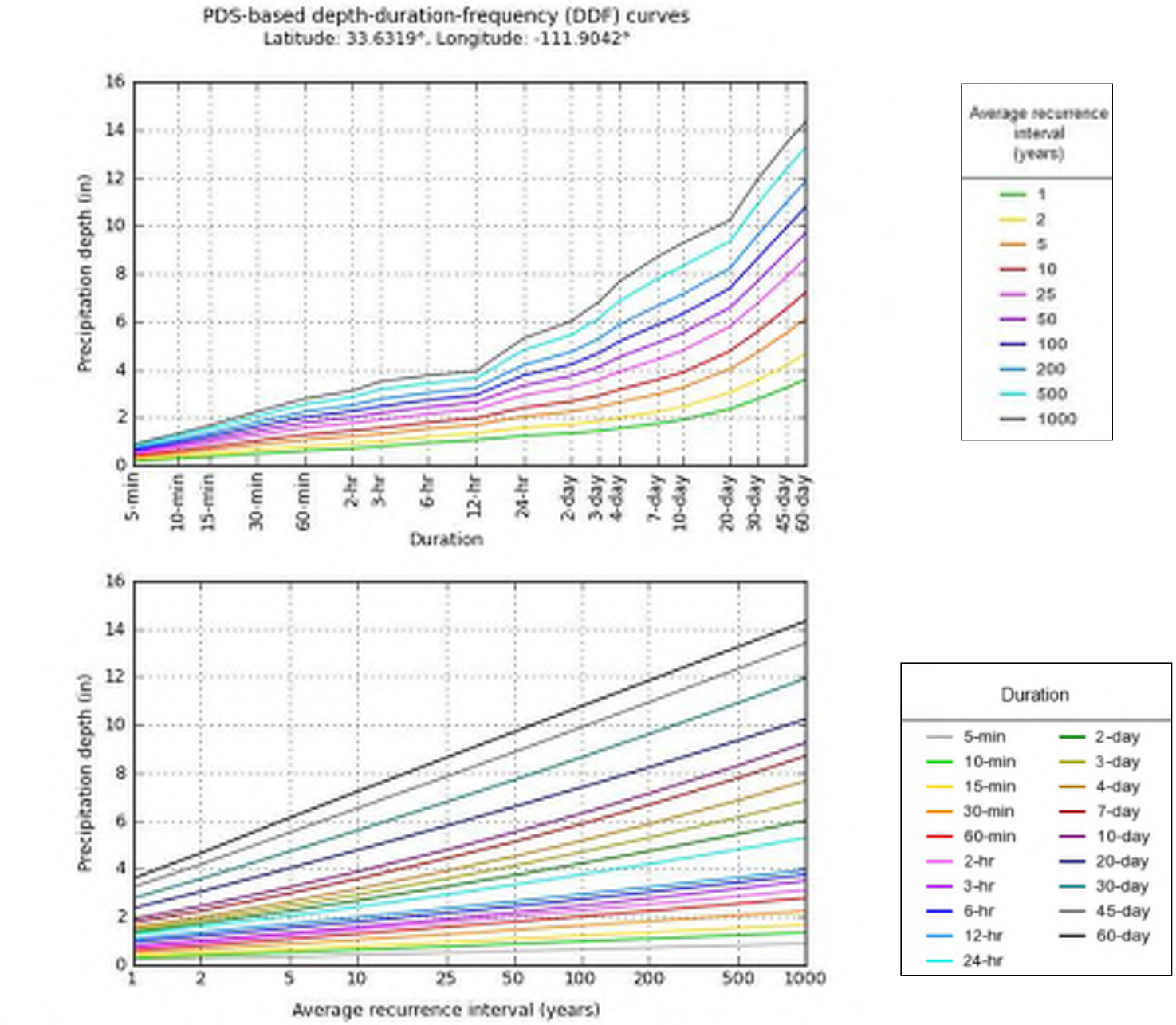
PF graphical



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Thu Nov 10 18:17:59 2022

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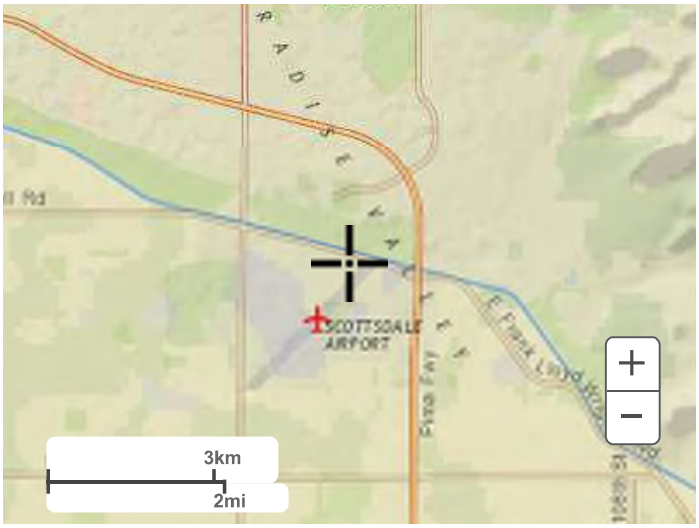
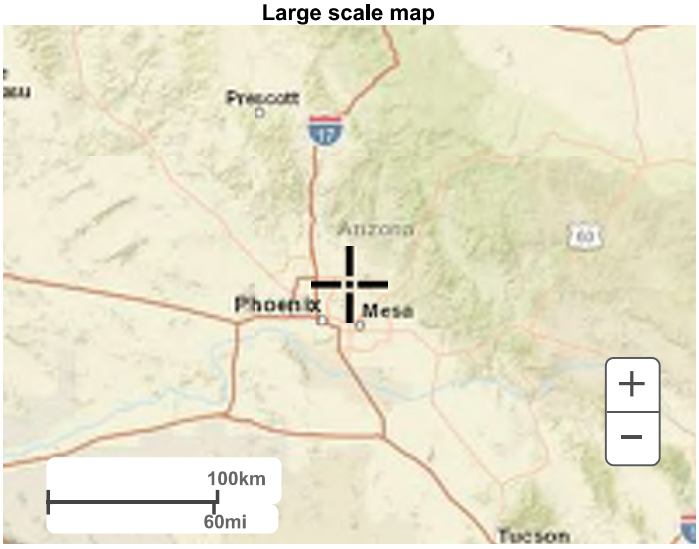
Maps & aerials

Small scale terrain

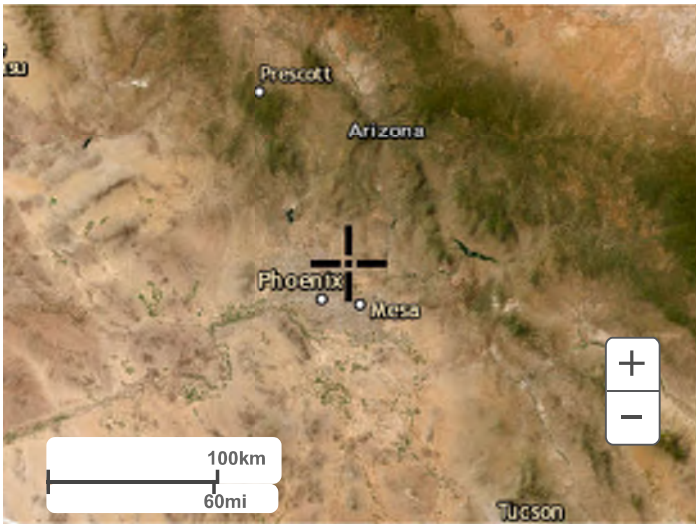


Large scale terrain

Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

RETENTION SUMMARY

DRAINAGE AREA (ID)	*VOLUME REQUIRED* (V_r) (ft^3)	*VOLUME PROVIDED* (V_p) (ft^3)	*VOLUME EXCESS* (ft^3)	*NOTES* (ID)
1P	3,358	3,534	176	To Underground Tank (UST-01)
2P	4,667	5,105	438	To Underground Tank (UST-02)

All volume provided exceeds volume required.

Retention is for the 100-year, 2-hour storm event.

First Flush Volume for Drainage Area 1P is:	740	ft^3	< 100-yr, 2-hr volume
First Flush Volume for Drainage Area 2P is:	1,029	ft^3	< 100-yr, 2-hr volume

VOLUME REQUIRED (100-YR, 2-HR)

Pursuant to the City of Scottsdale *Design Standards & Policies Manual 2018* , Section 4-1.201.C.1.a, Page 185
"For sites that have not been previously developed, or portions of a site thereof, the standard formula for determining the required stormwater storage runoff volume is shown below:"

$$V_r = C\left(\frac{R}{12}\right)A$$

Vr Required storage volume, cubic feet
C Runoff Coefficient, (per Figure 4-1.5 of the DPSM 2018, page 203)
R Precipitation amount = the depth of the 100-year, 2-hour rainfall from NOAA website, inches
A Area, square feet

DRAINAGE AREA	*RUNOFF COEFFICIENT*	*RAINFALL DEPTH*	*SUBBASIN AREA*		*VOLUME REQUIRED*		*NOTES:*
(ID)	(C)	(P)	(A)		(V)		
		(in)	(ft^2)	(acres)	(ft^3)	(acre-ft)	
1P	0.95	2.27	18,685	0.43	3,358	0.0771	To Underground Tank (UST-01)
2P	0.87	2.27	28,356	0.65	4,667	0.1071	To Underground Tank (UST-02)

VOLUME REQUIRED (FIRST FLUSH)

City of Scottsdale *Design Standards & Policies Manual 2018,* Section 4-1.201.C.2.a, Page 186:

$$V_{FF} = C\left(\frac{P}{12}\right)A$$

V_{FF} Minimum First Flush volume in ac-ft
C Weighted average runoff coefficient for the disturbed area of the proposed development
P Precipitation depth of 0.5 inches
A Area of project site in acres

MAJOR BASIN	*RUNOFF COEFFICIENT*	*RAINFALL DEPTH*	*MAJOR BASIN AREA*		*VOLUME REQUIRED*	
(ID)	(C)	(P)	(A)		(V)	
		(in)	(ft^2)	(acres)	(ft^3)	(acre-ft)
1P	0.95	0.50	18,685	0.4289	740	0.0170
2P	0.87	0.50	28,356	0.6510	1,029	0.0236

RUNOFF COEFFICIENT

Drainage Design Manual for Maricopa County, Volume II - Hydraulics . August 15, 2013.
Section 4.6, "Design Example," Equation 2.3.2.

$$C_W = \frac{A_1C_1 + A_2C_2 + \cdots + A_{n+1}C_{n+1}}{A_1 + A_2 + \cdots + A_{n+1}}$$

C_w Weighted Runoff Coefficient
A_i Area of Subbasin, square feet
C_i Runoff Coefficient for Subbasin, (as determined by:
City of Scottsdale *Design Standards & Policies Manual 2018,* Figure 4-1.5*)*

DRAINAGE AREA (ID)	***LAND USE***	***RUNOFF COEFFICIENT*** (C) (100-YR)	***SUBBASIN AREA*** (A) (ft^2)	(CA) (ft^2)	***WEIGHTED RUNOFF COEFFICIENT*** (C_W)
1P	Desert Landscaping	0.45	0	0	0.00
	Paved streets, Rooftops	0.95	18,685	17,751	0.95
1P			18,685	17,751	**0.95**
2P	Desert Landscaping	0.45	4,530	2,039	0.45
	Paved streets, Rooftops	0.95	23,826	22,635	0.95
2P			28,356	24,673	**0.87**

UNDERGROUND STORAGE VOLUME

$$V = \pi\left(\frac{D}{2}\right)^2 L$$

V Underground Storage Tank Volume
D Diameter of Storage Tank
L Length of Tank

RETENTION BASIN	*DIAMETER*	*LENGTH OF TANK*	*UNDERGROUND STORAGE VOLUME*	
(ID)	(D)	(L)	(V)	
	(ft)	(ft)	(ft^3)	(ac-ft)
UST-01	10	45	3,534	0.0811
UST-02	10	65	5,105	0.1172

NUMBER OF DRYWELLS REQUIRED

Pursuant to the City of Scottsdale Design Standards & Policies Manual 2018, Section 4-1.201.B.3, "A retention basin utilizing dry wells for the dissipation of stormwater may be permitted, subject to stormwater staff approval if: A dual-chamber system is designed to minimize sedimentation."

Drainage Design Manual for Maricopa County, Volume II - Hydraulics . August 15, 2013.
" Retention basins shall be drained within 36 hours following the storm" (Page 10-2)
"The accepted design disposal rate for a dry well should not be less than 0.1 cfs per well" (Page 9-18)

$$N = \frac{V_R}{36R_I}$$

N	Minimum Number of Injection Wells Required
V_R	Volume Retained in the Retention/Detention Basin in cubic feet
R_I	Approved Discharge Rate per Well in cubic feet per second
Drain Time	36 hours

RETENTION BASIN	*VOLUME RETAINED*	*DESIGN DISPOSAL RATE*		*NUMBER OF DRYWELLS*
(ID)	(V_R)	(R_I)		(N)
	(ft^3)	(ft^3/s)	(ft^3/hr)	
UST-01	3,534	0.10	360.00	1
UST-02	5,105	0.10	360.00	1

APPENDIX E: Warning & Disclaimer of Liability

Warning and Disclaimer of Liability

The Drainage and Floodplain Regulations and Ordinances of the City of Scottsdale are intended to "minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall" (Scottsdale Revised Code §37-16).

As defined in S.R.C. §37-17, a flood plain or "*Special flood hazard* area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with subsection 37-18(b) and adopted by the floodplain board." It is possible that a property could be inundated by greater frequency flood events or by a flood greater in magnitude than a 100-year flood. Additionally, much of the Scottsdale area is a dynamic flood area; that is, the floodplains may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY PURSUANT TO S.R.C §37-22

"The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by manmade or natural causes. This article (Chapter 37, Article II) shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder."

Compliance with Drainage and Floodplain Regulations and Ordinances does not insure complete protection from flooding. The Floodplain Regulations and Ordinances meet established local and federal standards for floodplain management, but neither this review nor the Regulations and Ordinances take into account such flood related problems as natural erosion, streambed meander or man-made obstructions and diversions, all of which may have an adverse affect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above. If I am an agent for an owner I have made the owner aware of and explained this disclaimer.

908-PA-2022		11/16/2022
Plan Check No.	Owner or Agent	Date

GRADING & DRAINAGE LANGUAGE

WARNING AND DISCLAIMER OF LIABILITY

The City's Stormwater and Floodplain Management Ordinance is intended to minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding.
The Stormwater and Floodplain Management Ordinance identifies floodplains, floodways, flood fringes and special flood hazard areas. However, a property outside these areas could be inundated by floods. Also, much of the city is a dynamic flood area; floodways, floodplains, flood fringes and special flood hazard areas may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY

The flood protection provided by the Stormwater and Floodplain Management Ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by constructed or natural causes. The Stormwater and Floodplain Management Ordinance does not create liability on the part of the city, any officer or employee thereof, or the federal, state or county government for any flood damages that result from reliance on the Ordinance or any administrative decision lawfully made thereunder.

Compliance with the Stormwater and Floodplain Management Ordinance does not ensure complete protection from flooding. Flood-related problems such as natural erosion, streambed meander, or constructed obstructions and diversions may occur and have an adverse effect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

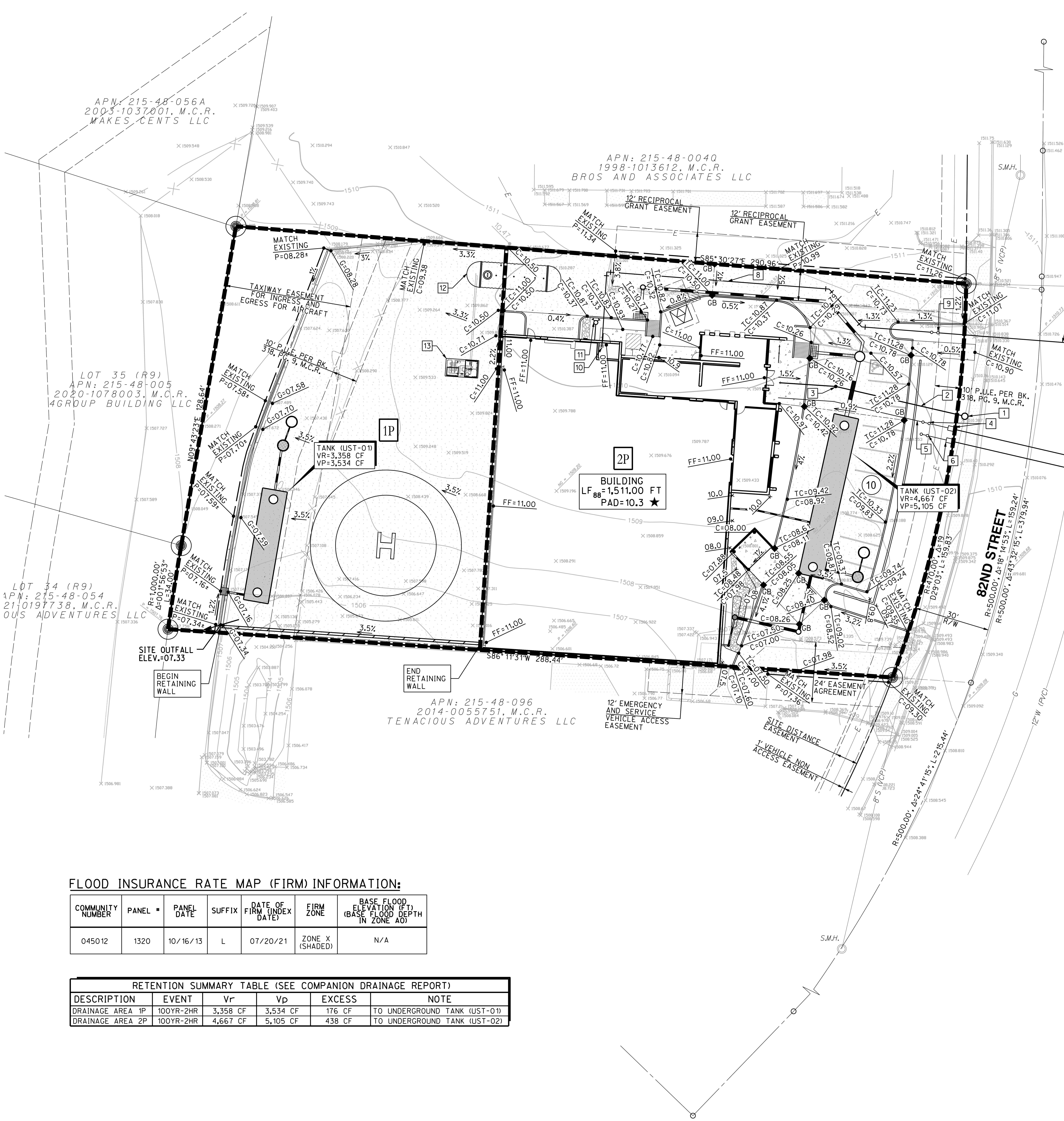
I have read and understand the above.

908-PA-2022		11/16/2022
Plan Check #	Owner	Date

APPENDIX F: Reference Documentation

1. *Preliminary Grading & Drainage Plans, prepared by JMC dated March 2023*

KEY ESSENTIALS HANGAR
16060 N. 82ND ST, SCOTTSDALE, AZ 85260
PRELIMINARY GRADING & DRAINAGE PLAN



FLOOD INSURANCE RATE MAP (FIRM) INFORMATION:

COMMUNITY NUMBER	PANEL #	PANEL DATE	SUFFIX	DATE OF FIRM (INDEX DATE)	FIRM ZONE	BASE FLOOD ELEVATION (FT) (BASE FLOOD DEPTH IN ZONE AO)
045012	1320	10/16/13	L	07/20/21	ZONE X (SHADED)	N/A

RETENTION SUMMARY TABLE (SEE COMPANION DRAINAGE REPORT)

DESCRIPTION	EVENT	Vr	Vp	EXCESS	NOTE
DRAINAGE AREA 1P	100YR-2HR	3,358 CF	3,534 CF	176 CF	TO UNDERGROUND TANK (UST-01)
DRAINAGE AREA 2P	100YR-2HR	4,667 CF	5,105 CF	438 CF	TO UNDERGROUND TANK (UST-02)

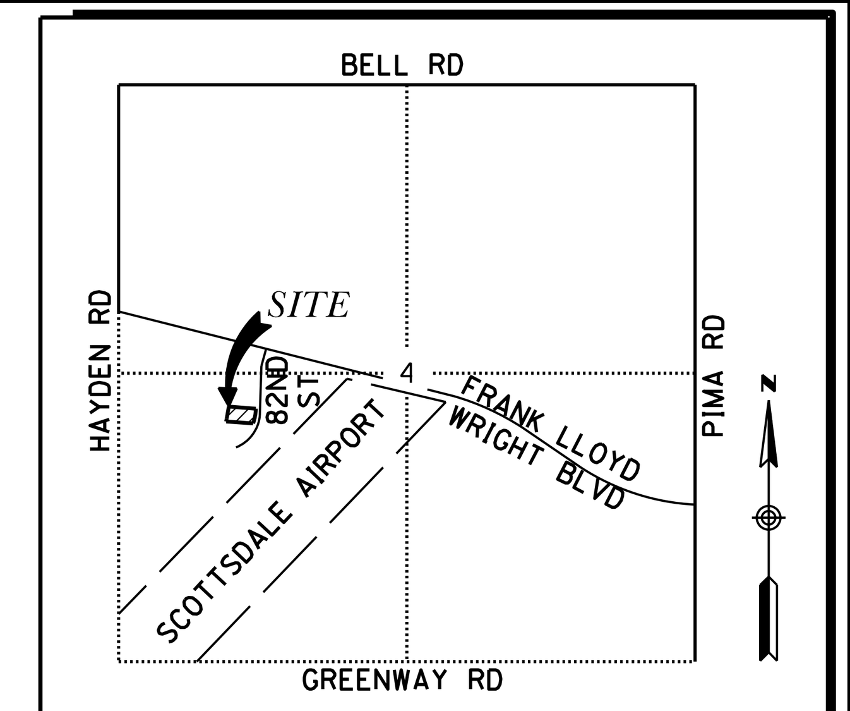
KEY NOTES:

1. NEW SEWER MANHOLE
2. NEW SEWER SERVICE
3. NEW SEWER CLEANOUT
4. NEW DOMESTIC WATER METER & BACKFLOW
5. NEW DOMESTIC WATER SERVICE
6. NEW IRRIGATION METER, SERVICE & BACKFLOW
7. NEW TAPPING SLEEVE
8. NEW FIRE SERVICE
9. NEW FIRE LINE BACKFLOW
10. NEW FIRE RISER
11. NEW REMOTE FIRE DEPARTMENT CONNECTION (FDC)
12. NEW 20,000 GALLON JET-A UNDERGROUND FUEL TANK
13. NEW BELOW GROUND EQUIPMENT VAULT

SCALE 1" = 20'

0 20 40 60

★ NOTE:
VERIFY PAD GRADE WITH FINAL BUILDING PLANS



VICINITY MAP
N.T.S.

ENGINEER:
JMC ENGINEERING, PLLC
7315 N 16TH STREET, SUITE 101
PHOENIX, AZ 85020

CONTACT: JOSEPH M. CIRONE, P.E.
PHONE: (602) 374-4148
EMAIL: JCIRONE@JMC-ENG.COM

ADDRESS:
16060 N 82ND ST
SCOTTSDALE, AZ 85260

APN NUMBERS:
215-48-005R

BENCHMARK:
EAST QUARTER CORNER OF SECTION 1, BEING GDACS POINT NUMBER 26006-Z1 HAVING AN ELEVATION OF 1523.687, NAVD88 DATUM PER THE MCDOT SURVEY DATA SHEET AVAILABLE ONLINE. THE BENCHMARK MONUMENT IS DESCRIBED AS A SET 5/8"RB W/ 2"MARICOPA COUNTY AL CAP FL STAMPED "T3N R4E R5E 1/4 S1 2005 RLS 21782".

ARCHITECT:
DPA ARCHITECTS, INC
3719 N 75TH STREET, SUITE 105
SCOTTSDALE, AZ 85251

CONTACT: JOHN S. SZAFRAN
EMAIL: JSSZAFRAN@DPAARCHITECTS.COM

LEGAL DESCRIPTION:
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 1, TOWNSHIP 3 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA

BASIS OF BEARING:
THE MONUMENT LINE OF 83RD STREET, USING A BEARING OF S00°29'12"W, PER THE MAP OF DEDICATION, RECORDED IN BOOK 299, PAGE 20, M.C.R.

BENCHMARK STATEMENT:
"I HEREBY CERTIFY THAT ALL ELEVATIONS PRESENTED ON THIS PLAN ARE BASED ON NAVD-1988 AND MEET THE FEMA BENCHMARK MAINTENANCE (BMM) CRITERIA"

JOSEPH M. CIRONE, P.E — 03/09/2023 DATE

LEGEND:

- PROPERTY LINE
- ROADWAY CENTERLINE
- SAWCUT LINE
- SETBACK LINE
- EASEMENT
- NO. PARKING SPACES
- HANDICAP PARKING
- CONCRETE
- EXISTING FIRE HYDRANT (FH)
- EXISTING SEWER MANHOLE (S.M.H.)
- EXISTING WATER LINE (8"W (PVC))
- EXISTING SEWER LINE (8"S (VCP))
- EXISTING ELECTRIC LINE (E)
- EXISTING GAS LINE (G)
- DIRECTION OF FLOW & SLOPE (1%)
- PROPOSED PAVEMENT ELEVATION (P=XX.XX)
- PROPOSED TOP OF CURB ELEVATION (TC=XX.XX)
- PROPOSED GUTTER ELEVATION (G=XX.XX)
- PROPOSED CONCRETE ELEVATION (C=XX.XX)
- PROPOSED FLOWLINE ELEVATION (FL=XX.XX)
- FINISH FLOOR ELEVATION (FF=XX.XX)
- GRADE BREAK (GB)
- PROPOSED UNDERGROUND RETENTION STORAGE TANK
- PROPOSED STORM DRAIN
- PROPOSED STORM DRAIN MANHOLE
- PROPOSED GRATED AREA DRAIN
- PROPOSED ADS NYLOPLAST INLINE DRAIN WITH SOLID COVER
- PROPOSED ROOF DRAIN CLEANOUT
- PROPOSED DRYWELL
- PROPOSED CATCH BASIN
- PROPOSED TRENCH DRAIN
- DRAINAGE AREA DELINEATION
- DRAINAGE AREA ID (1P)

Contact Arizona 811 at least two full working days before you begin excavation
Call 811 or click Arizona811.com

REVISIONS		
NO.	DESCRIPTION	DATE

Registered Professional Engineer (Civil) — CERTIFICATE NO. 40968 — JOSEPH M. CIRONE — Date Signed 03-09-23 — ARIZONA, U.S.A.
Expires: 6-30-2025

JMC ENGINEERING
7315 N 16TH STREET
SUITE 101
PHOENIX, AZ 85020
JCIRONE@JMC-ENG.COM

DESIGNED: JMC/HTF
DRAWN: MJR

PROJECT NO: 0140
DATE: 9-MAR-2023

SHEET 1 OF 1

41-DR-2022