ANDAZ RESORT EXPANSION
CONCEPTUAL DRAINAGE DESIGN MEMO
May 18, 2022

Project Description:

The project site is rectangular in shape and encompasses approximately 5.03 acres and is currently undeveloped and vacant. The proposed development for the site includes construction of 10 new villas, ranging in size from approximately 2,145 sq. ft. (2-bedroom) to 4,070 sq. ft. (4-bedroom) with a new private 24-foot wide access drive. Proposed improvements will also include extensions of the private on-site sewer, water and fire lines to provide service to each villa and a proposed stormwater retention basin located at the south side of the site to provide the required stormwater retention volume.

The intent of this Conceptual Drainage Design Memo is to preliminarily calculate the required volume of stormwater storage based on the Town of Paradise Valley standard drainage requirements and demonstrate that this required volume can be retained in an on-site above ground retention facility.

Site Information:

Assessor’s Parcel No.: 174-65-004C

Site Address: 6041 N. Quail Run
Paradise Valley, AZ 85253

Site Area: 219,027 sq. ft. (5.03 acres)

Existing Site Conditions:

The existing property is currently vacant with minimal vegetation. The site slopes from west to east and there are no existing storm drain structures or retention facilities on-site.

Proposed Drainage Improvements:

The proposed development will include the construction of 10 new villas, each accessed off of a new private drive running north-south down the middle of the site. The proposed site grading will raise the elevation of each villa and provide a means of drainage around each towards the new private drive. From there, stormwater runoff will be routed down the gutter of the proposed drive to the south, where it will discharge into a new catch basin and be piped to the proposed above ground retention basin located at the south end of the property. The location of the proposed catch basin will also allow for an overland flow path to the new retention facility in the event that the catch basin becomes clogged or is inundated beyond its capacity.

<u>Storm Water Storage:</u>

In accordance with Section 3-2 of the current Town of Paradise Valley Storm Drainage Design Manual, the development will be required to retain runoff from the 100-year, 2-hour duration storm falling within the boundaries of the development. This volume is determined from the equation below:

Vr = C(R/12)A

where,

> Vr = Required storage volume in cubic feet.
> R = Precipitation amount = The depth in inches of the 100-year, 2-hour rainfall.
> A = Area of disturbance in square feet.
> C = Weighted average runoff coefficient over entire site.

For the subject property, the value of "R" is determined from NOAA Atlas 14 Point Precipitation Frequency Estimates at the location of the project. This value is 2.19" as found on a copy of NOAA Atlas 14, attached.

As the proposed land usage is assumed to be similar to a single family residential development, an average runoff coefficient, "C", of 0.80 is used to reflect a "Medium Density Residential" land use category, per Table 3.2 of the Flood Control District of Maricopa County's Drainage Design Manual, Hydrology, current issue.

Therefore, the required stormwater storage for the proposed site improvements has been calculated as such:

<u>Vr = (0.80) x (2.19/12) x (219,027) = 31,978 cubic feet</u>

A proposed above ground retention basin has been preliminarily sized to contain this required volume, and will be located at the south side of the property. As shown on the Conceptual Grading and Drainage Plan, the proposed basin will <u>provide a total volume of 32,562 cubic feet</u> at a maximum depth of three feet with 4:1 side slopes, per the Town's Storm Drainage Design Manual requirements. A summary of the provided volume calculation is included at the end of this design memo.

Disposal of retained stormwater will be achieved utilizing drywells to ensure the required volume of water is drained within the required 36-hour maximum time period.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
41972
BRENT R.
STEFFENHAGEN
Date Signed ....
ARIZONA U.S.A.
Expires 03-31-2023

NOAA Atlas 14, Volume 1, Version 5
Location name: Paradise Valley, Arizona, USA*
Latitude: 33.5263°, Longitude: -111.9296°
Elevation: 1308.37 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)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.186** (0.156-0.227)	**0.243** (0.204-0.297)	**0.330** (0.275-0.401)	**0.396** (0.328-0.481)	**0.486** (0.397-0.587)	**0.555** (0.447-0.667)	**0.626** (0.495-0.750)	**0.699** (0.543-0.836)	**0.795** (0.601-0.952)	**0.869** (0.644-1.04)
10-min	**0.283** (0.237-0.346)	**0.370** (0.311-0.452)	**0.502** (0.418-0.611)	**0.603** (0.500-0.732)	**0.740** (0.603-0.893)	**0.846** (0.680-1.01)	**0.953** (0.753-1.14)	**1.06** (0.826-1.27)	**1.21** (0.916-1.45)	**1.32** (0.981-1.59)
15-min	**0.350** (0.293-0.428)	**0.458** (0.385-0.560)	**0.622** (0.518-0.757)	**0.748** (0.620-0.907)	**0.917** (0.748-1.11)	**1.05** (0.843-1.26)	**1.18** (0.934-1.42)	**1.32** (1.02-1.58)	**1.50** (1.14-1.80)	**1.64** (1.22-1.97)
30-min	**0.472** (0.395-0.577)	**0.617** (0.519-0.754)	**0.838** (0.698-1.02)	**1.01** (0.834-1.22)	**1.24** (1.01-1.49)	**1.41** (1.14-1.70)	**1.59** (1.26-1.91)	**1.78** (1.38-2.12)	**2.02** (1.53-2.42)	**2.21** (1.64-2.65)
60-min	**0.584** (0.489-0.714)	**0.764** (0.642-0.934)	**1.04** (0.864-1.26)	**1.25** (1.03-1.51)	**1.53** (1.25-1.85)	**1.75** (1.41-2.10)	**1.97** (1.56-2.36)	**2.20** (1.71-2.63)	**2.50** (1.89-2.99)	**2.73** (2.03-3.28)
2-hr	**0.678** (0.576-0.811)	**0.878** (0.746-1.05)	**1.18** (0.993-1.40)	**1.40** (1.17-1.67)	**1.71** (1.41-2.02)	**1.94** (1.59-2.30)	**2.19** (1.76-2.58)	**2.44** (1.92-2.87)	**2.77** (2.13-3.26)	**3.03** (2.28-3.59)
3-hr	**0.744** (0.629-0.900)	**0.953** (0.810-1.16)	**1.25** (1.06-1.51)	**1.49** (1.24-1.79)	**1.82** (1.50-2.17)	**2.08** (1.69-2.48)	**2.36** (1.88-2.80)	**2.64** (2.07-3.14)	**3.04** (2.31-3.61)	**3.36** (2.49-3.99)
6-hr	**0.895** (0.773-1.06)	**1.13** (0.981-1.34)	**1.45** (1.25-1.71)	**1.71** (1.46-2.00)	**2.05** (1.73-2.39)	**2.32** (1.93-2.70)	**2.61** (2.13-3.02)	**2.89** (2.32-3.36)	**3.29** (2.57-3.82)	**3.60** (2.74-4.19)
12-hr	**1.00** (0.872-1.17)	**1.26** (1.10-1.47)	**1.60** (1.39-1.86)	**1.86** (1.61-2.16)	**2.22** (1.89-2.56)	**2.49** (2.10-2.87)	**2.78** (2.30-3.20)	**3.06** (2.50-3.53)	**3.44** (2.75-3.99)	**3.74** (2.93-4.36)
24-hr	**1.19** (1.05-1.37)	**1.51** (1.33-1.74)	**1.96** (1.72-2.25)	**2.31** (2.03-2.66)	**2.80** (2.44-3.21)	**3.19** (2.76-3.65)	**3.60** (3.09-4.11)	**4.02** (3.42-4.59)	**4.60** (3.87-5.25)	**5.05** (4.21-5.80)
2-day	**1.29** (1.13-1.47)	**1.64** (1.45-1.88)	**2.16** (1.90-2.47)	**2.57** (2.25-2.93)	**3.14** (2.74-3.59)	**3.60** (3.12-4.11)	**4.09** (3.52-4.67)	**4.59** (3.92-5.24)	**5.30** (4.47-6.06)	**5.86** (4.90-6.73)
3-day	**1.36** (1.20-1.56)	**1.75** (1.54-2.00)	**2.30** (2.02-2.62)	**2.75** (2.40-3.13)	**3.37** (2.94-3.84)	**3.88** (3.36-4.41)	**4.41** (3.79-5.03)	**4.98** (4.24-5.67)	**5.77** (4.86-6.58)	**6.41** (5.35-7.33)
4-day	**1.44** (1.27-1.65)	**1.85** (1.63-2.11)	**2.44** (2.14-2.78)	**2.92** (2.56-3.32)	**3.60** (3.13-4.10)	**4.15** (3.59-4.72)	**4.74** (4.07-5.38)	**5.36** (4.56-6.10)	**6.24** (5.25-7.10)	**6.96** (5.79-7.94)
7-day	**1.62** (1.42-1.85)	**2.07** (1.82-2.37)	**2.74** (2.40-3.13)	**3.28** (2.86-3.74)	**4.05** (3.51-4.61)	**4.66** (4.02-5.31)	**5.32** (4.56-6.06)	**6.02** (5.12-6.87)	**7.01** (5.88-8.00)	**7.81** (6.48-8.93)
10-day	**1.75** (1.54-2.00)	**2.24** (1.97-2.56)	**2.96** (2.60-3.37)	**3.54** (3.10-4.02)	**4.35** (3.79-4.94)	**5.01** (4.33-5.67)	**5.70** (4.90-6.46)	**6.43** (5.49-7.29)	**7.46** (6.28-8.46)	**8.28** (6.91-9.41)
20-day	**2.16** (1.91-2.45)	**2.78** (2.45-3.14)	**3.67** (3.24-4.15)	**4.35** (3.82-4.91)	**5.26** (4.61-5.93)	**5.96** (5.20-6.72)	**6.67** (5.79-7.54)	**7.40** (6.39-8.37)	**8.38** (7.17-9.51)	**9.14** (7.76-10.4)
30-day	**2.52** (2.22-2.86)	**3.25** (2.86-3.68)	**4.28** (3.77-4.85)	**5.07** (4.45-5.73)	**6.13** (5.36-6.93)	**6.95** (6.05-7.84)	**7.79** (6.75-8.77)	**8.64** (7.45-9.73)	**9.79** (8.38-11.0)	**10.7** (9.06-12.1)
45-day	**2.91** (2.58-3.29)	**3.75** (3.32-4.24)	**4.95** (4.38-5.58)	**5.84** (5.15-6.58)	**7.01** (6.16-7.90)	**7.89** (6.91-8.89)	**8.79** (7.66-9.91)	**9.68** (8.41-10.9)	**10.9** (9.37-12.3)	**11.8** (10.1-13.3)
60-day	**3.21** (2.86-3.62)	**4.15** (3.69-4.67)	**5.47** (4.85-6.14)	**6.42** (5.68-7.22)	**7.67** (6.77-8.61)	**8.59** (7.55-9.65)	**9.52** (8.34-10.7)	**10.4** (9.10-11.7)	**11.6** (10.1-13.1)	**12.5** (10.8-14.2)

[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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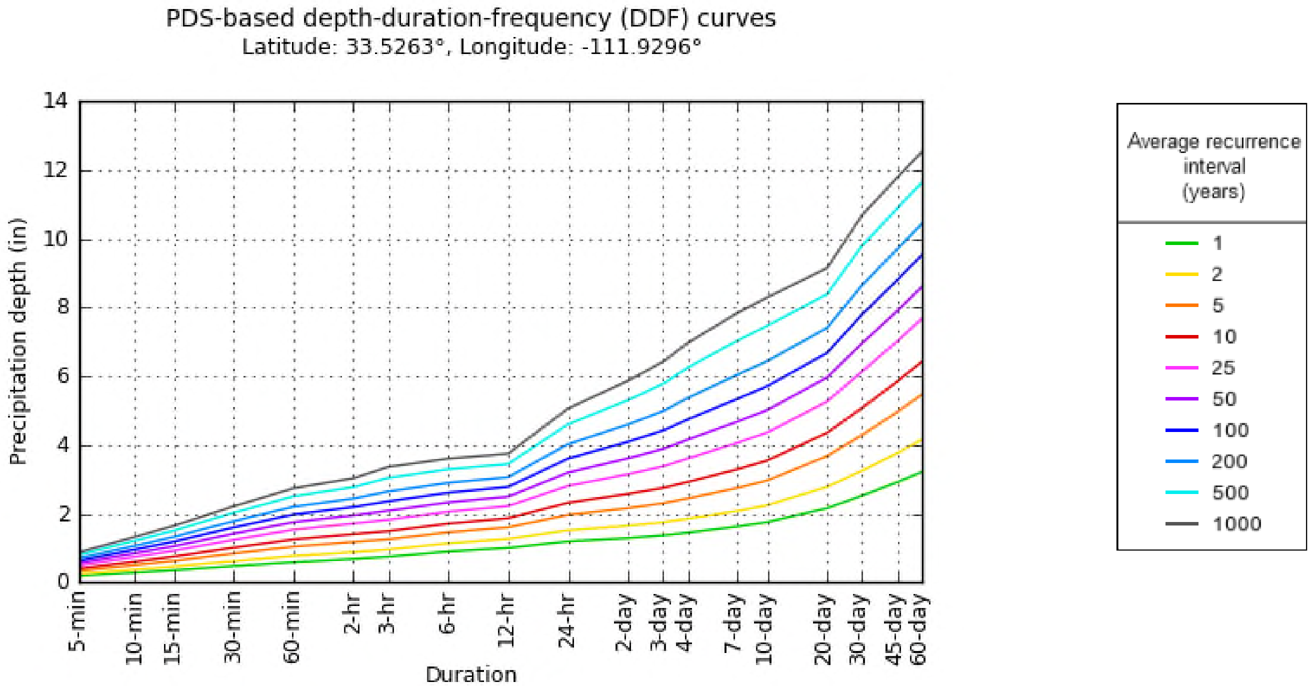
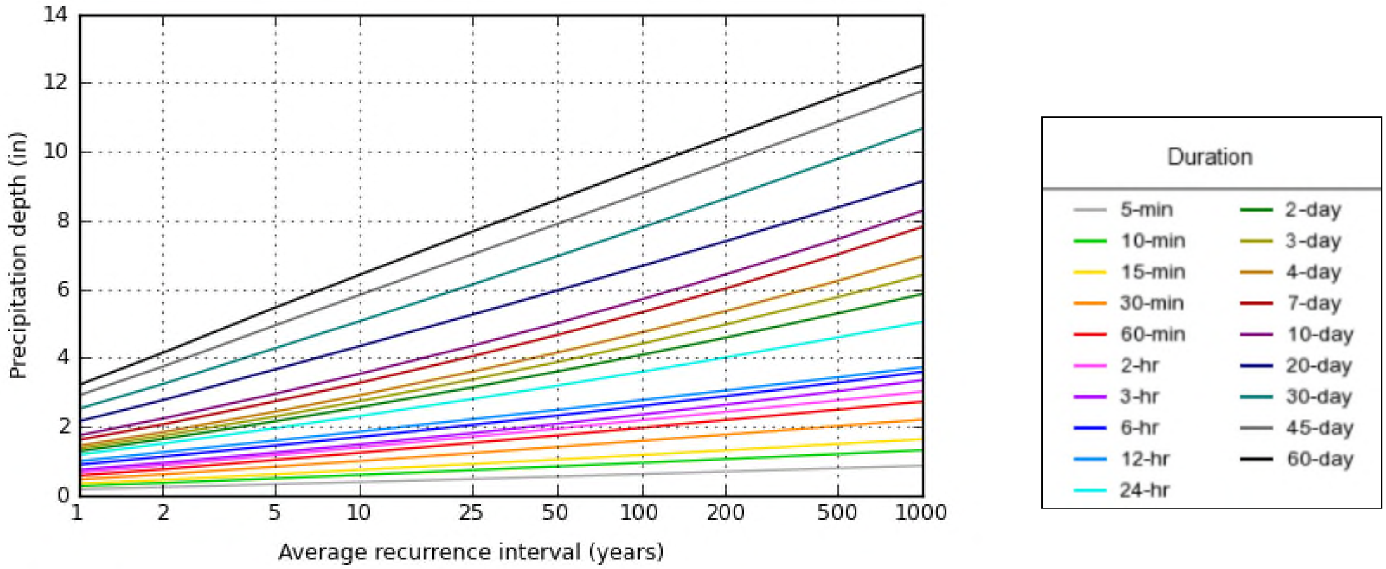
PF graphical





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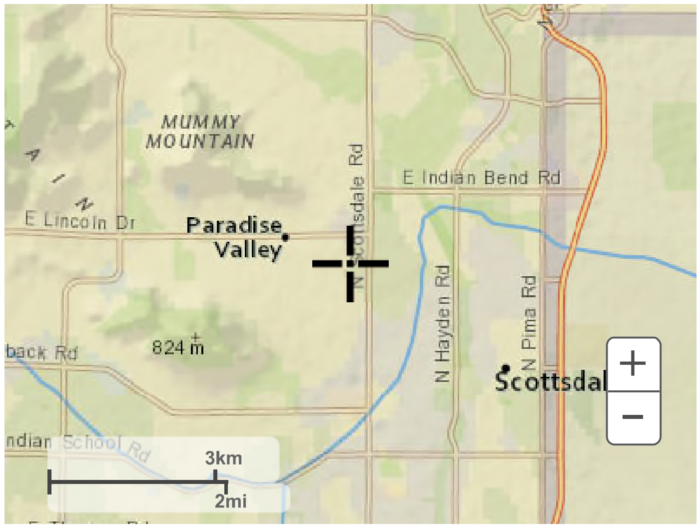
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

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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

HYDRAULIC CALCULATION SHEET
Provided Retention Volume Calculations
Hubbard Engineering

Project Name: Andaz Quail Run Parcel
Project No.: 22121

Prepared By: BRS **Date:** 5/13/2022

Volume Provided (Vp) = $\frac{d}{3}\left[A_1 + A_2 + \sqrt{(A_1)(A_2)}\,\right]$

RB-01

Elevation	Area	Depth	Volume	
	[ft^2]	[ft]	[ft^3]	[ac-ft]
1311.00	14,559			
		1.00	13,317	0.3057
1310.00	12,113			
		1.00	10,822	0.2484
1309.00	9,580			
		1.00	8,423	0.1934
1308.00	7,317			
TOTAL			**32,562**	**0.7475**